SP-2000/X-Y
AutoCam™ Pedestal

Operation, Installation
And Maintenance
(pn AB-300101 for sn 80xxxx0020 - 021601)

Vinten

SP-2000/X-Y Pedestal

Safety

IMPORTANT!: Read the Safety Section starting on page 1-2 before installing or using this equipment, or attempting any adjustment or repair. This safety triangle is used in the manual to indicate important information. Read this information carefully to avoid the risk of personal injury, injury to others, or damage to the equipment.

Warning Labels

Various colored safety labels are attached to the AutoCam equipment to alert you to hazardous situations. The labels and their meaning are described below.

DANGER (with a red background) indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING (with an orange background) indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION (with a yellow background) indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION (with a yellow background, but without the Safety Alert symbol) indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Critical Data For SP-2000/X-Y

Mass (Weight)	525 lb (239 kg)
Maximum Load	320 lb (145 kg)
Maximum Pressure	150 bar (2200 psi)
Input Voltage	+36 VDC nominal
Input Power*	+4 Amps nominal +12 Amps peak
Date Of Manufacture	2001

* NOTE: In a typical system, the AC power consumption of the pedestal, head and rack mount power supply combined is 1000W maximum.

CE

Technical Support

If you are based in North, South or Central America and need technical support on the AutoCam system, contact Vinten Inc. at:
709 Executive Blvd.
Valley Cottage, NY 10989
USA

Phone:1-888 4 VINTEN (1-888-484-6836) - Toll free in the U.S.A.
+1 845-268-0100
Fax:+1 845-268-0113

Or, if you are based outside of North, South or Central America, contact Vinten Broadcast Limited at:
Western Way
Bury St. Edmunds
Suffolk IP33 3TB
ENGLAND

Phone: +44 (0) 284 752121
Fax: +44 (0) 284 750560

Warranty

Vinten, Incorporated (Vinten) warrants that its equipment shall be free of defects in material and workmanship for a period of twelve (12) months from the first date of installation, but no more than eighteen (18) months from date of shipment, and is extended only to the original purchaser. Vinten, at its option, will repair or replace defective components. Warranty covers only those defects that occur when the equipment is used in the manner described in the Operation, Installation, and Service manual. Vinten's liability is limited to parts, material, and labor necessary to repair or replace equipment manufactured by Vinten. Any and all consequential damages are excluded. Consumable supplies and normal wear items are the customer's responsibility and are not covered by this warranty.

The warranty is in effect only when equipment is operated, adjusted, and maintained in the manner described in the appropriate Operation, Installation, and Service manual. Modifications, service by non-authorized service personnel, failure to provide proper maintenance, and abuse and misuse of the equipment will void the warranty. Repairs not covered by this warranty will be billed for parts, labor, and expenses at the rates in effect at the time of service.

Warranty service and repair will normally be performed at the Vinten factory in Valley Cottage, New York, but may, at the discretion of Vinten, be performed on the customer site. It is the customer's responsibility to contact Vinten and obtain authorization prior to returning equipment for warranty service. Returned equipment must include a Return Material Authorization (RMA) number, and a failure report describing the nature of the failure or complaint as well as the customer's name, address, and a contact name and phone number.

Copyright

The Vinten Inc. AutoCam User Manual is copyrighted with all rights reserved. Under the copyright law, this manual may not be copied, in whole or in part, without written consent from Vinten Inc.

© 1995 - 2001 by Vinten Inc.

Disclosure Statement - AutoCam System

This document contains information proprietary to Vinten Inc. Except by written authorization from Vinten Inc., the information contained in this document shall not, in whole or in part, be disclosed to third parties, reproduced for any purpose, or used except for evaluation, operation and maintenance of equipment supplied by Vinten Inc. or Vinten Broadcast.

Manual Outline

This manual covers the installation, operation and maintenance of the AutoCam SP-2000/X-Y robotic pedestal. See Chapter 1 for a detailed description of the contents of this manual.

Product Serial Numbers

Vinten AutoCam products are marked with unique serial numbers that include a 2 digit product identifier, a 4 digit serial number and a 2 character revision code. The format is AABBBBXXCD where:

AA	Product Identifier - 80 for the SP-2000/X-Y
BBBB	Serial number
XX	Reserved for future use - currently 00
C	Primary revision status - 0, 1, 2, 3 etc.
D	Secondary revision status - 0, A, B, C etc.

This manual is applicable to products that have serial numbers 80xxxx0020 where xxxx may be any 4 digit number.

AutoCam™, Vinten Inc.™ and Lubricated Friction (LF™) are trademarks of Vinten Inc. or Vinten Broadcast Limited.

Specifications and features are subject to change without prior notice.

(021601)

SP-2000/X-Y Pedestal ii
Safety ii
Warning Labels ii
Critical Data For SP-2000/X-Y iii
Technical Support iv
Warranty v
Copyright vi
Disclosure Statement - AutoCam System vi
Manual Outline vi
Product Serial Numbers vi

1 Safety & Introduction

Safety Issues 1–2
Pedestal E-STOP Switches 1–2
Other E-StOP Switches 1–3
Other Important Information 1–5
Customer Responsibility 1–5
Safe Working Environment 1–5
Safe Operating Zone And Pedestal Footprint 1–6
Pedestal Active Lights 1–6
Warning Signs 1–7
Pedestals And Heads Can Start Unexpectedly 1–7
Collision Bumper And Bumper Override 1–8
Bumper Override 1–8
Pinch Points 1–9
Sharp Edges 1–9
Manual Outline 1–10
The SP-2000/X-Y Servo Pedestal 1–12
AutoCam Philosophy 1–14
Seamless Integration Into The Studio 1–14
"Like Being Behind A Camera" 1–14
An Easy Transition 1–15
Typical Applications 1–16
ACP-8000P System 1–16
Typical System Configuration 1–17

2 Operation

Introduction 2–2
Orientation 2–3

Powering Up The SP-2000/X-Y 2–4
Powering Down 2–5
Standby/Charge 2–5
Stop 2–5
Emergency STOP Switches 2–6
Direction Indicators 2–8
Pedestal Active Lights 2–9
Using The MCB Controller 2–10
Local/Remote 2–10
Drive 2–10
Rotate 2–10
Raising/Lowering The Column 2–10
Targeting 2–11

3 Installation

Introduction 3–2
Tools You Will Need 3–2
Floor Preparation For Robotic Pedestals 3–3
Removing The SP-2000/X-Y From Its Crate 3–4
Uncrating The Pedestal 3–4
Unloading The Pedestal 3–6
AC Powered Unloading 3–8
Mounting The Pan/Tilt Head & Payload 3–10
MCB Controller Mounting 3–11
Pressurizing And Balancing The Pedestal 3–12
Pressurizing The Pedestal 3–12
Balancing The Pedestal 3–14
Finishing Up 3–15
Discharging The Pedestal 3–15
Calibrating The Collision Bumpers 3–16
Electrical Installation And Interconnection 3–18
Removing The Payload 3–22
Recrating The Pedestal 3–24
Crating The Pedestal 3–25

4 Maintenance And Repair

Safety 4–2
Other Important Information 4–3

Customer Responsibility 4–3
Pedestals And Heads Can Start Unexpectedly 4–3
Pinch Points 4–4
Sharp Edges 4–4
Routine Maintenance 4–6
Cleaning The Targets 4–6
Removing Targets 4–6
DC Power 4–7
Column Balance 4–7
Overall Operation 4–7
E-STOP Switch Operation 4–8
Collision Bumper Operation 4–8
Removing The Covers 4–9
The North Cover 4–9
The West Wheel Cover 4–10
The East Wheel Cover 4–11
Replacing The Covers 4–12
Cleaning The Target Sensors 4–14
Cleaning The Slip Rings 4–16
Examining The Wheels 4–18
Cylinder Replacement 4–20
Electronics Repair 4–22
Service Philosophy 4–22
Safety 4–22
Calibration 4–24
Collision Bumpers 4–24
Target Sensor Calibration 4–26
Theory Of Operation 4–30
System 4–30
Power Bus 4–30
Data Bus 4–30
Battery Pack and Power Management 4–31
Battery Bypass 4–32
The Targeting System 4–34
Lowering The Sensors 4–34
The Sensor Assembly 4–34
The Dolly Board 4–34
4-Channel Servo Boards 4–35
Analog 4–35
Digital 4–35
Brushless Motors 4–36
Motor Drive Amplifiers 4–36

This page left blank intentionally.

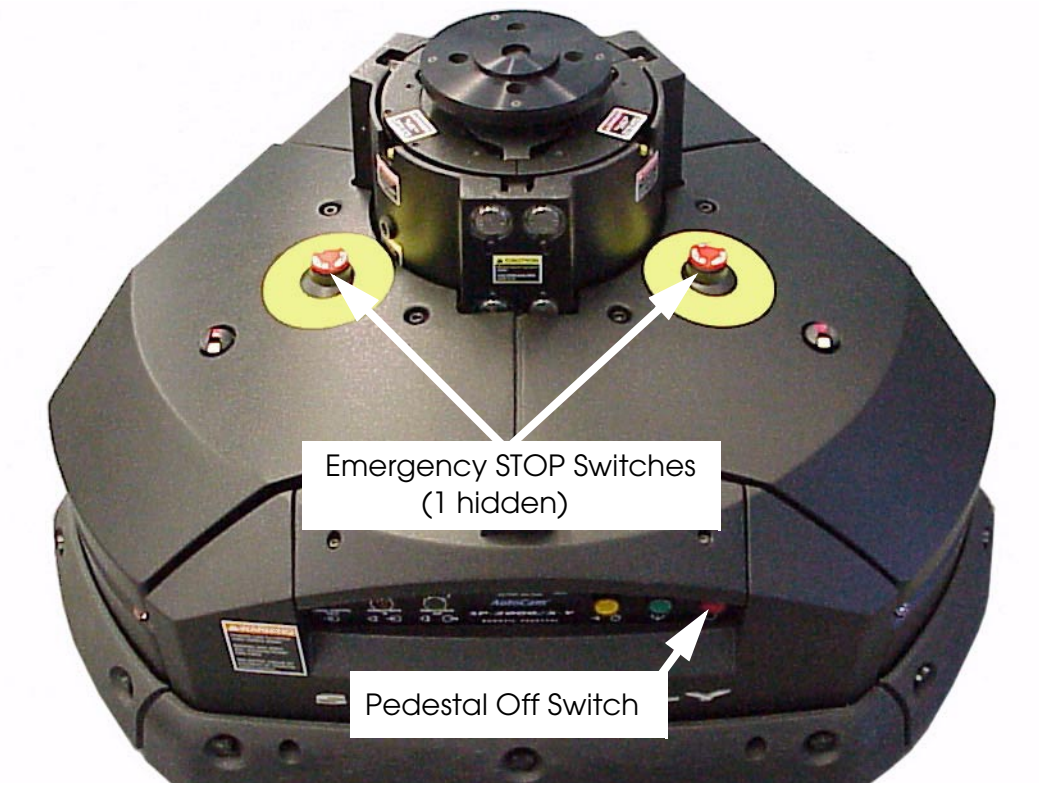
1 Safety & Introduction

Safety Issues

Safety issues including important warnings, risks and related topics are covered in this section of the manual. It is very important that this information be available to all personnel who will work on or near the Autocam equipment.

Pedestal E-STOP Switches

3 EMERGENCY STOP switches are located on the top of each pedestal base. Make sure that all personnel are aware of the location and operation of these pedestal E-STOP switches and the main pedestal power down switch before operating the equipment. Press down firmly on any one of the E-STOP switches to immediately disable the pedestal and head.



The Off Switch can also be used, but only if the operator can press it quicker that than one of the E-STOP switches.

After clearing the cause for the emergency stop, twist the appropriate E-STOP switch clockwise to release it. The pedestal and head can now be powered up and targeted - see Chapter 2 for operating procedures.

Other E-StOP Switches

An E-Stop switch for each pedestal (of the type shown below) is installed at each operator location and optionally at other locations.

Make sure that all personnel are aware of the location and operation of these E-STOP switches before operating the equipment. Press down firmly on the E-STOP switch to immediately disable the associated pedestal and head.

After clearing the cause for the emergency stop, pull up the appropriate E-STOP switch. The pedestal and head can now be powered up and targeted - see Chapter 2 for operating procedures.

WARNING! - Always set the column to minimum height, turn power off and engage the two locking pins in the base of the column before removing the camera or other payload equipment from the head. Or, discharge the gas from the pedestal.

Locking Pin Installed
DANGER
Max. cylinder pressure is 1250 psi (86 bar.)
Use only Vinten supplied manifold for adjusting pressure.
WARNING
pressurized cylinders.
Install locking pins prior to removing load.

WARNING - NEVER work directly under the camera if the column is raised. In the unlikely event that the gas pressure supporting the column is lost, the head and payload may drop quickly.

CAUTION - NEVER stand under the payload when you power up the pedestal or switching from Local to Remote on the MCB Controller. The column may change height quickly.

CAUTION - NEVER attach cables to the head or camera which could pull the pedestal over if it is moved with the column extended.

CAUTION - Depending on your choice of equipment, the payload in your application may be over 300 lb (over 136 kg). Therefore, to avoid personal injury, or injury to others, we recommend that each element of the payload (teleprompter, lens, camera etc.) be removed separately. ALWAYS follow the handling instructions supplied by the manufacturers of the payload equipment. Make sure that you have enough people involved to safely handle the weight of your payload equipment.

Other Important Information

1. To avoid personal injury, always exercise caution when working in the vicinity of energized pedestals as they can start to move without any warning.

2. TUnless it is impossible, you should always de-energize the pedestal and head before working on any part of the pedestal, the head, the camera/lens, or any associated equipment.

Customer Responsibility

It is the customer's responsibility to ensure that the workplace is safe. Make sure that you comply with local safety requirements for owning and operating robotic equipment. In normal operation, the remote controlled pedestals, heads and payloads in an Autocam system can move suddenly and without warning. Since audible warnings are out of the question in normal television applications, it is recommended that only trained personnel be allowed to work in the active areas where the remote controlled pedestals, heads and payloads are located. As part of the training, personnel must be made aware of the hazards of working in a robot environment, including the specific hazards listed below. The forces are sufficient to cause personal injury, or injury to others and therefore, caution is essential.

Safe Working Environment

Each of the remote controlled pedestals should be within the view of the operator of the Autocam system at the controller. Before and during remote operation, the controller operator must verify visually that the active area is clear. If personnel are too close to one of the pedestals that is about to move, the operator can prevent the motion from starting, or stop the motion after it has started.

If the direct line of sight is obstructed in your installation, it is recommended that one or more viewing cameras are installed to cover the active areas and allow the operator to view the entire workspace at all times.

Safe Operating Zone And Pedestal Footprint

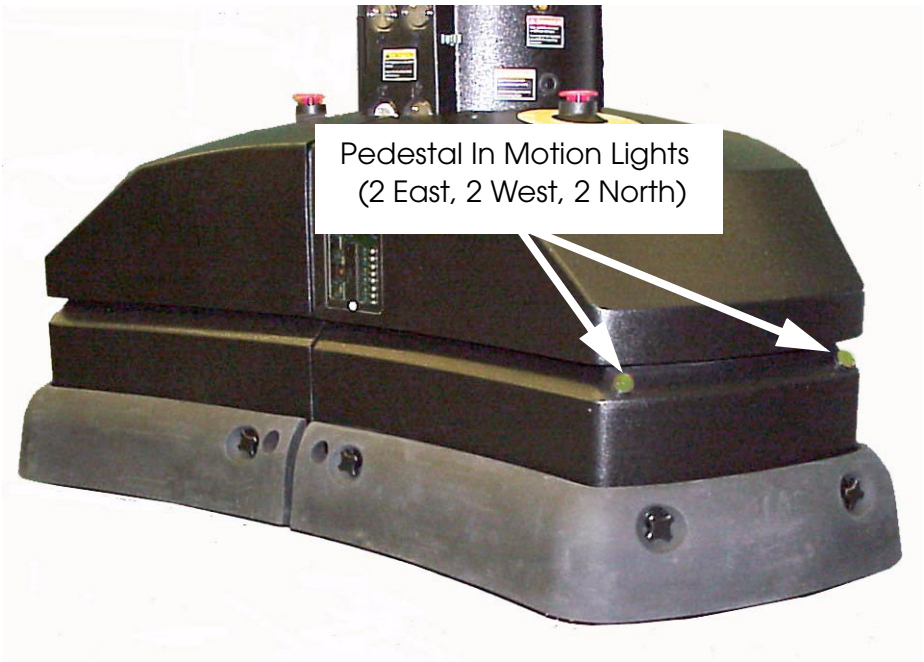
The safe operating zone for personnel is a minimum of 3 feet (1m) outside of the pedestal footprint. This allows time for the personnel to avoid a pedestal that starts to move at its maximum speed of approximately 1 foot per second (0.3m per second).

The pedestal footprint is typically larger than the pedestal base itself. In most installations, the teleprompter is the piece of equipment mounted on the head that protrudes the furthest beyond the base of the pedestal. Or, it may be the manual control bars on the rear that protrude the furthest. The footprint must take into account the overhang of the teleprompter and/or manual control bars as the head pans around.

If your operating practices require personnel to work less than 3 feet (1m) outside the pedestal footprint, you must make sure that they are trained and are aware of the hazards of working in a robot environment, including the specific hazards listed below. The forces are sufficient to cause personal injury, or injury to others and therefore, caution is essential.

Pedestal Active Lights

At each corner of the base of the pedestal, a pair of lights will flash to indicate that the pedestal is in motion, or may move at any time without additional warning. These lights are activated by Locate mode at the controller and do not operate if the pedestal is being controlled locally by the MCB controller.



Warning Signs

Warning signs should be displayed prominently in the workplace as a reminder to trained personnel, and a primary warning to untrained personnel and visitors. A typical sign might read:

WARNING:
Robotic Pedestals, Heads And Lenses
Move Suddenly Without Warning

Pedestals And Heads Can Start Unexpectedly

The hazards associated with robotic camera systems are only slightly different than those associated with operating a camera under conventional manual control. The speeds and camera weights are similar. The main difference is that with automation, the operator is normally not near the cameras, and it is more difficult to verify that the area is clear. For personnel working on or near the pedestals, they must be aware that the equipment can start moving unexpectedly.

All personnel should be trained and aware of the hazards of robotic pedestals and heads, and the fact that they can move at any time. They must be trained on how far the pedestals, heads and payloads can move, the speeds involved, and the need to stay back an appropriate distance.

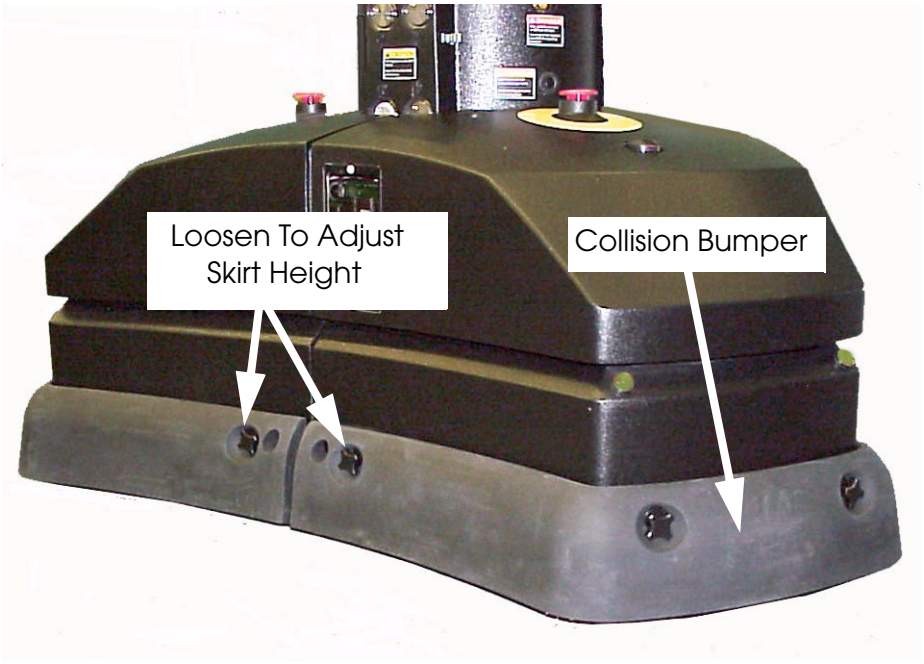
Most adjustments to the camera and head, such as balancing and camera calibration, should be made with the system de-energized. However, if adjustments are absolutely necessary while the pedestal and/or head is powered, they should only be made by trained technical personnel familiar with the AutoCam robotics system. They must understand that the pedestal or head can move unexpectedly at any time, and they must position themselves so that any motion would not cause them personal harm.

When the robotic heads move, the speeds involved are fairly slow. However, the equipment is still capable of generating sufficient force to cause injury. Therefore, it essential that you exercise caution. In particular, be aware that the teleprompter is usually the fastest swinging element.

Any failure of the system could possibly cause one or more axes to move on their own, but the speeds and forces should not be noticeably greater than those encountered during normal use.

Collision Bumper And Bumper Override

The skirts around the base of the pedestal contain a collision detection bumper that automatically stops the pedestal if it collides with an obstacle. The bumper as shown below is electro-optical and is an integral part of the cable skirt..



The electro-optical bumper system does require calibration - see Chapter 4

When a collision occurs, the sequence of events is:

1. The pedestal involved in the collision stops immediately. Pan, tilt, zoom, focus and pedestal height are still active, so operation can still continue using a stationary pedestal.
2. An error message (“dolly “n” stopped, bumper contact”) appears on the controller touchscreen where “n” is the number of the pedestal that tripped its bumper. A “B” appears in the column of the pedestal that has tripped its bumper circuit. Touch anywhere on the screen to clear the error message and continue operation.
3. As soon as is practical, check the work area to clear the obstacle that caused the collision and use LOCATE mode (see Controller User Manual) to back the pedestal away. Be aware that the other pedestals in the studio are still active and can move at any time.The “B” will disappear indicating that the bumper circuit is reset. Normal operation can now continue.

Bumper Override

In the unlikely event that a pedestal stops due a failure in the collision detection system, or the bumper does not reset after a collision, it is still possible to continue operating in an emergency. In this situation, the “B” on the screen will not disappear when you back away from the obstacle but you can still operate the pedestal.

HOWEVER, THIS IS FOR EMERGENCY OPERATION ONLY BECAUSE THE BUMPERS ARE NO LONGER ACTIVE AND WILL NOT STOP THE PEDESTAL IF THERE IS ANOTHER COLLISION. IT IS NOT SAFE TO OPERATE THE PEDESTAL WITHOUT COLLISION BUMPER PROTECTION.

As soon as possible, check the collision bumper system and circuit calibration (electro-optical bumper type only - see Chapter 4) to determine the cause of the failure and take corrective action.

Pinch Points

Particular care should be exercised around possible points where you could get pinched, such as the tilt cradle. Here, the forces can be somewhat greater, due to the short lever arm.

Sharp Edges

If the lens, teleprompter or other camera attachments have sharp edges that could cause injury, make sure they are padded or protected.

Manual Outline

Chapter 1	This chapter covers important safety issues and gives an overview of the SP-2000/X-Y pedestal and the AutoCam system.
Chapter 2	Step by step instructions for operating the SP-2000/X-Y pedestal.
Chapter 3	Step by step instructions for unpacking and installing the SP-2000/X-Y pedestal.
Chapter 4	Technical information including routine maintenance, circuit descriptions, calibration, schematics and parts lists.

This page left blank intentionally.

The SP-2000/X-Y Servo Pedestal

The SP-2000/X-Y is a freely navigating XY servo pedestal designed to operate with the HS-2010 series of pan/tilt heads to support full facility CCD studio or portable cameras with lens, viewfinder and teleprompter. The maximum payload capacity including the pan/tilt head is 320 lbs (145 kg).

The SP-2000/X-Y base has specially designed servos with a proprietary guidance and position sensing system which produces a very high degree of accuracy. Since the system does not use a closed loop reference, the SP-2000/X-Y avoids the need for constant visibility of the reference target during use. Once the target coordinates have been loaded into the system, the pedestal will operate with unparalleled accuracy for extended periods without needing to verify its position with external sources. An exclusive split wheel design ensures that the pedestal has a very low cumulative error and will maintain its accuracy beyond the length of any expected production.

The SP-2000/X-Y has an extremely stable two-stage column. A rigid triangular bearing arrangement delivers smooth, yet stiff operation over the entire height range, from a low of 21” to a high of 50”.

The pan bar mounted MCB controller allows you to drive and steer the pedestal and raise and lower the column under local control.

When used with the ACP-8000P controller, the studio perimeter and objects within the studio can be mapped. Pedestal movements are then coordinated to ensure that collisions are avoided. The SP-2000/X-Y also includes safety bumpers to stop the pedestal on contact with an object.

Communication with the controller is by RS422 data via the power supply up to a maximum distance of 5000 feet (1,500 m). A slim power/data cable connects the pedestal to the rack mounted power supply up to a maximum distance of approximately 180 feet (55 m).

The SP-2000/X-Y incorporates an on-board battery for backup in the event of a power failure. The pedestal automatically switches to battery operation if the input DC power is lost. Depending on actual usage, battery operation can continue for up to two hours. Battery operation is also used to drive the pedestal on and off the skid during packing and unpacking, or to drive the pedestal between studios without cables attached.

AutoCam Philosophy

The underlying goal of AutoCam is to build on the proven operating practices of today's studios. Immense amounts of time and effort have gone into optimizing these procedures, and it would be a mistake to suggest any significant change for the sake of automation. Instead, camera automation should blend into and enhance the present studio environment, offering its substantial operating economies. On news and similar sets, one operator typically can control all of the cameras and often the CCU functions as well; and has no difficulty staying well ahead of the shots.

From the outset, AutoCam was a top-down design, culminating years of discussions with network, affiliate, independent, and EFP visionaries. It was engineered to be expandable to accommodate the largest installations, such as 8-camera robotic-dolly studios on multiple floors, controlled from multiple locations. Yet it is also scaleable to the simplest single-camera EFP assignments. The identical system architecture is employed across this entire range of installations. Software configuration screens on the console are used to configure each installation; as opposed to customized hardware. This stable architecture philosophy has many benefits: easy system expansion or upgrading, better factory support, and higher reliability.

Seamless Integration Into The Studio

Successful camera automation should be as transparent as possible to the studio staff, and particularly to the director. He or she should expect the same communications with the camera console operator, as with multiple camera operators in a traditional studio. As before, a named shot from the run-down list is relayed over the headsets. But the operator now no longer needs to continually re-frame those shots. They only need to be taught once at the console, and given the same names that the director uses. Then, when each camera and shot is called over, the operator touches that name on the touch screen, sending the specified camera to that shot. AutoCam is also flexible and intuitive, and changes in the run-down are easily accommodated. Stories may readily be dropped or stretched or reordered as studio events unfold in a dynamic manner.

"Like Being Behind A Camera"

Effective camera automation should also be as transparent as possible to the camera operator. In designing the console, a great deal of effort was devoted to presenting essentially the same controls that are present at the camera: a pan/tilt "bar", and zoom, focus, pedestal, and dolly controls. Further, considerable engineering went into making the controls smooth and responsive, so that they have a quality feel like the controls on a camera. This allows both fast and reflexive operation, and superior on-air movement quality. To complete the "behind-the-camera" analogy, a color monitor at the console reproduces the viewfinder. The

big difference is that at the touch of a finger, not one but up to eight cameras can now be controlled.

The heart of the friendliness of the console is the color touch screen. It presents all of the information the operator needs in one place, in a plain-language manner. The video underlay and the control sticks are assigned together and dynamically to the last camera event selected. Colors are used in a powerful and consistent manner to convey important information; such as which named shot each camera is framing, which keys are logical to be touched next, and which camera is on-air. Information on the screen is intelligently limited and dynamically updated; only the touch-keys that have meaning in a given situation are shown.

Going one step beyond remote camera control, the console adds the capability to memorize essentially any camera event, from a simple shot to a dolly bumper or group move. The operator now “manages by exception”, directing AutoCam to frame the shots, and then trimming them as necessary.

An Easy Transition

Everyone is concerned that the transition to automation be quick and painless. AutoCam facilitates this by adopting the genre and jargon of the studio, and delivering stable software yet reconfigurable hardware. A measure of the success of this philosophy is how easy it is to install AutoCam and train operators to use the system. Stations have installed 3-camera dolly systems in one day, and aired programs the next.

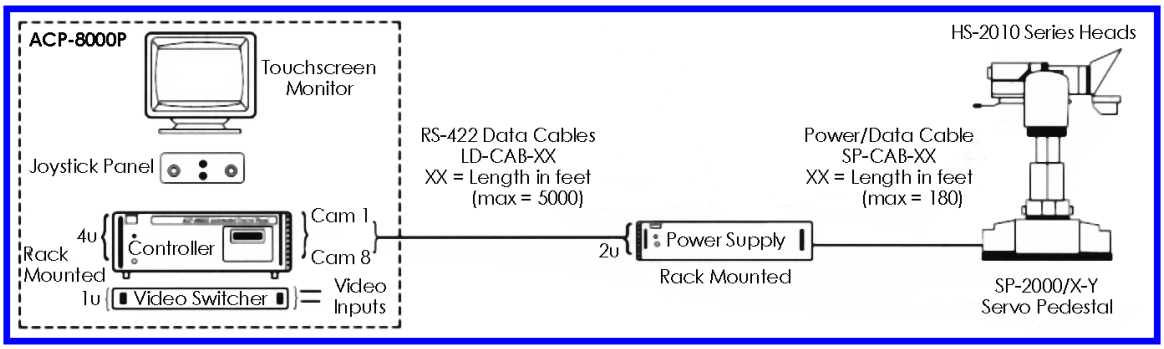
Typical Applications

The SP-2000/X-Y servo pedestal will typically be installed with the HS-2010R or HS-2010MH pan & tilt head. Up to eight pedestals and heads can be controlled remotely with the AutoCam™ ACP-8000P touchscreen controller. Communication between the head and the controller is by RS-422 data.

Refer to the User Manuals for your specific heads and controller for more information.

ACP-8000P System

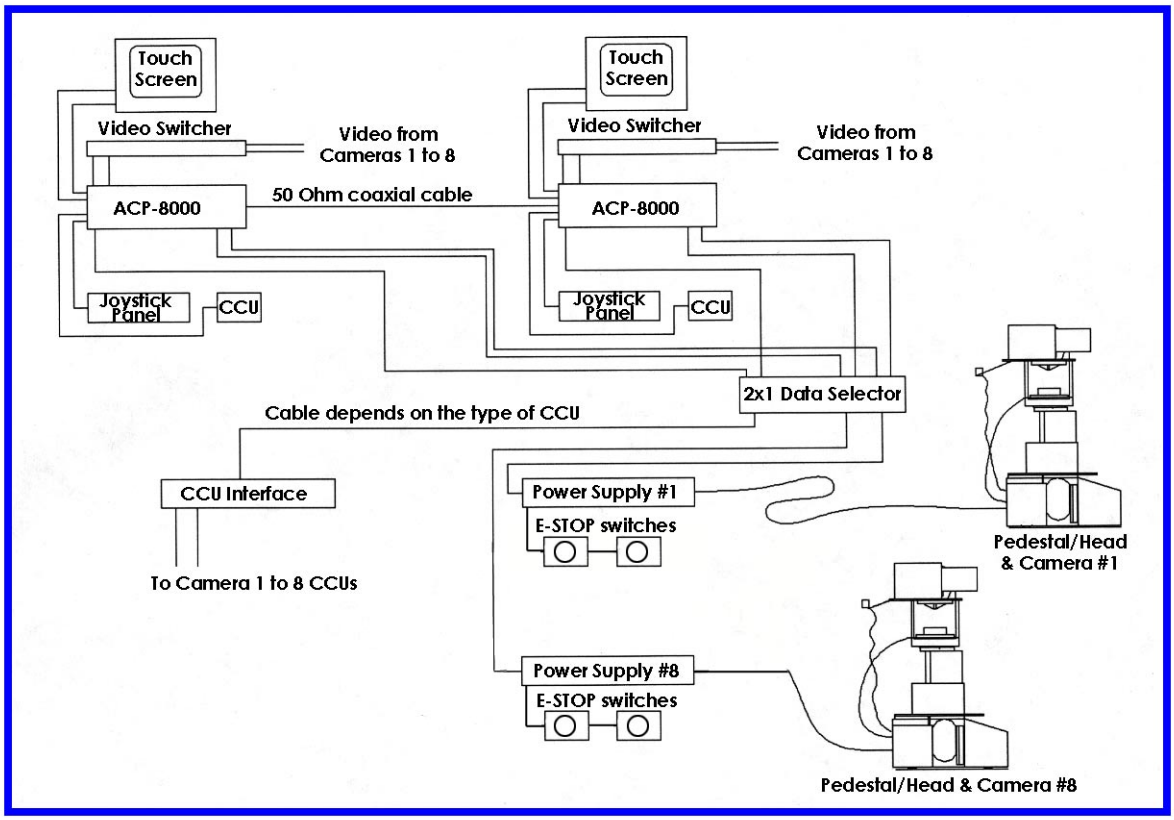
In systems with one or more (up to eight) servo pedestals, the ACP-8000P controller is used as shown below



The distance between the controller and rack mounted power supply for the data connection can be up to a maximum of 5000 ft. (1500 m). The power/data connection from the power supply to the pedestal can be up to a maximum of 180 ft (55 m). The power and data is looped from the pedestal up to the head.

Typical System Configuration

The diagram below illustrates the interconnection of a typical AutoCam™ system.



In this example, two ACP controllers are installed to provide backup and/or workload sharing. The 2x1 Data Selector routes the selected data lines to the power supplies and optional CCU interface.

This page left blank intentionally.

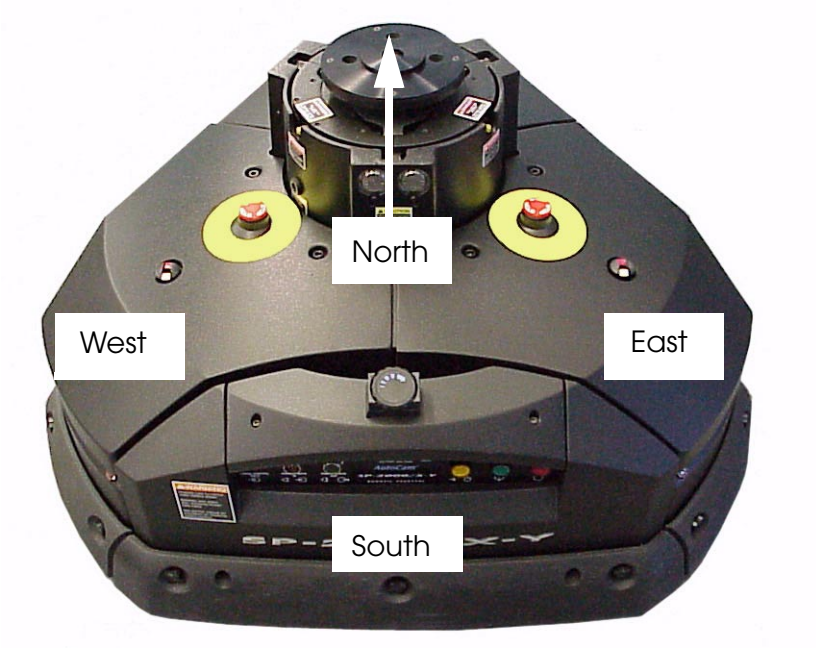
2 Operation

Introduction

This chapter covers operation of the pedestal and is limited to the switches, controls and other features on the pedestal itself. Operating procedures for controlling the pedestal remotely are described in the User Manual for the specific controller in your installation.

Orientation

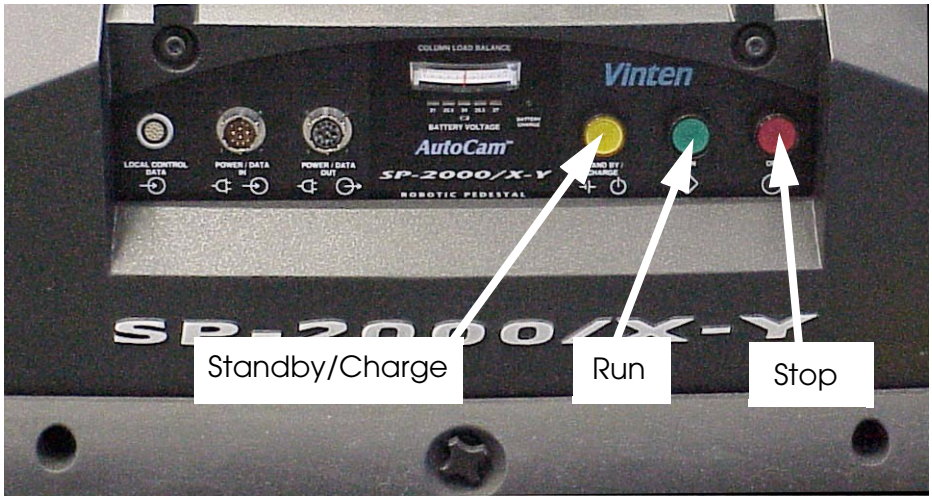
As an aid in operating and maintaining the SP-2000/X-Y, it is useful to define the orientation of the pedestal by the points of the compass - North, South, East and West.



As shown in the picture above, the main control panel is on the South side of the pedestal, the “front” wheel of the pedestal is on the North side and the other two wheels are on the East and West sides.

Powering Up The SP-2000/X-Y

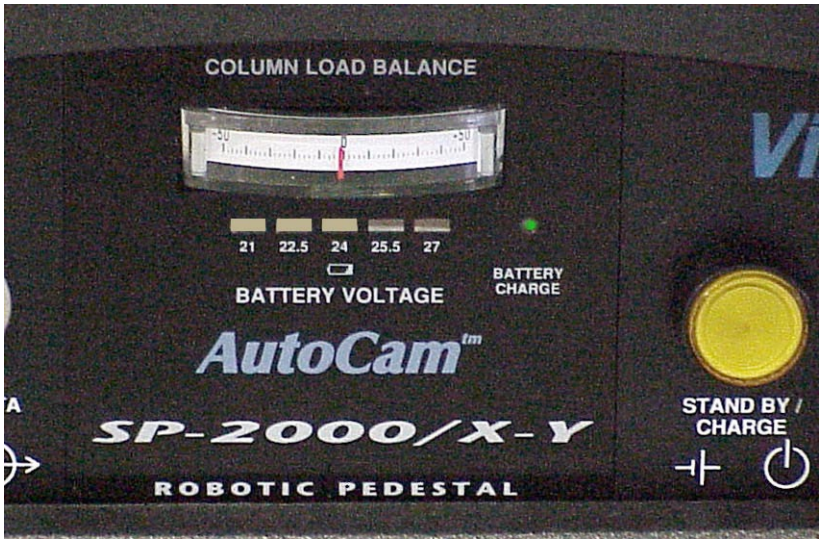
A relay latching circuit ensures that if power is lost (even momentarily) the pedestal cannot restart automatically - it must be powered up manually.



1. Before you power up a pedestal, first make sure that the head is turned off, the MCB controller is in Remote and the area around the pedestal is clear.

Warning: At power up, the column (and payload) will drop to a low level for a few seconds. Make sure that nobody will be hit by any part of the payload.

2. Press the Standby/Charge (yellow) button and hold it until the relay latches and the yellow light stays on. If the external power supply is connected, it is now charging the batteries. The green Battery Charge LED will illuminate confirming that DC power is reaching the pedestal. The “voltmeter” to the left of the Battery Charge LED indicates the battery voltage.



3. Press the Run (green) button to power up the pedestal.
4. The column and the three wheels will initialize. You will see the direction indicators on the wheels rotate one by one as they initialize. Do not attempt to drive the pedestal until initialization is complete.
5. Once the pedestal is powered up and initialized, turn on the head.

Powering Down

Always power down the head before the pedestal.

The pedestal can be powered down to Standby/Charge mode or turned off completely in Stop mode. Or, in an emergency, use any one of the three Emergency STOP Switches - see next section.

Standby/Charge

In normal operation, if the pedestal will be left unattended for a long period of time (overnight for example), press Standby/Charge to power down the electronics but leave the batteries charging.

Stop

Press Stop to power down the pedestal completely.

Emergency STOP Switches

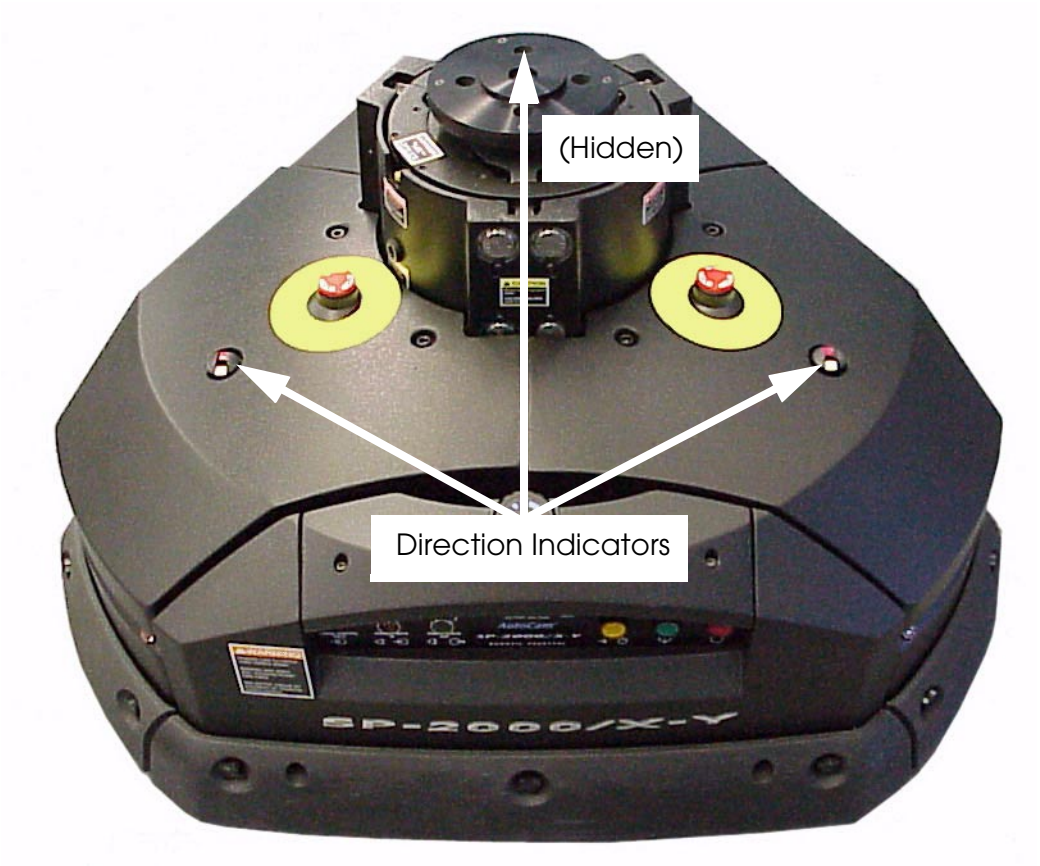
In an emergency, a pedestal can be stopped and disabled immediately by pressing down on any one of the three Emergency STOP Switches on the base of the pedestal, or one of the E-STOP switches at the operator console.

An E-STOP switch for each pedestal (of the type shown below) is installed at each operator location and optionally at other locations.

After clearing the cause for the emergency stop, release the E-STOP switch that was activated. On the pedestal, twist the E-STOP switch clockwise to release it. At the operator consloe just pull up on the E-STOP switch. Power up the pedestal and head as described earlier.

Direction Indicators

On each wheel assembly, the direction indicator shows which way the wheel is oriented. The red marker shows the “forward” direction of the wheel.



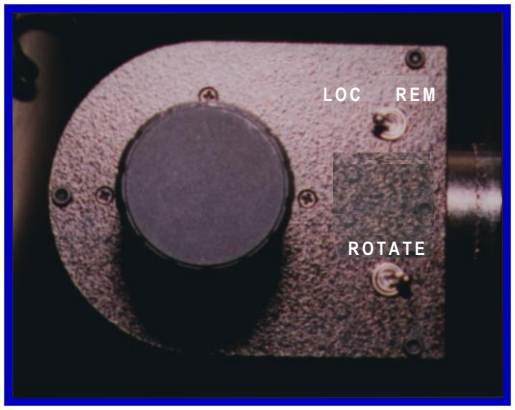
In Drive mode, all three wheels are parallel to each other. This allows the pedestal to crab in any desired direction. In Rotate mode, the three wheels are tangential to the pedestal circumference allowing it to rotate in place.

Pedestal Active Lights

On the North, East and West corners of the pedestal, a pair of green lights will flash to indicate that the pedestal is in motion, or may move at any time without additional warning. These lights are activated by Locate mode at the controller and do not operate if the pedestal is being controlled locally by the MCB controller.

Using The MCB Controller

The MCB controller provides local control at the pedestal, with or without an ACP-8000P controller connected.



Local/Remote

The MCB must always be in Remote (top switch to the right) when the pedestal is powered up. In Remote, the controller has control of the pedestal operation.

In Local mode (top switch to the left), the MCB joystick controls the pedestal.

Drive

With the Rotate switch to the right, push the joystick up/down/left/right or any angle in between to drive the pedestal in the desired direction. Regardless of the pan angle of the head, up/down on the joystick drives the pedestal in the North and South direction. Right/left on the joystick drives the pedestal East and West.

Rotate

With the Rotate switch to the left, push the joystick left/right to rotate the pedestal in place.

Raising/Lowering The Column

Twist the joystick knob to raise or lower the column. Do not raise or lower the column until it has been pressurized and balanced - see Chapter 3.

Targeting

Targeting the pedestal is fundamental to the operation of the AutoCam system. However, targeting is initiated at the controller and cannot be performed at the pedestal itself. Installing the targets, measuring their positions and the targeting procedure are described in Chapter 3 of the User Manual for your controller - for example the ACP-8000P.

This page left blank intentionally.

3 Installation

Introduction

This chapter covers uncrating the pedestal, driving it off the skid and installing it into your system. These instructions will also be useful if the pedestal needs to be relocated to a different studio or a new facility. Refer to the User Manuals for your pan/tilt heads and controller for additional information.

For proper performance of the equipment and to prevent personal injury it is critical that the procedures in this manual are followed exactly.

Tools You Will Need

You will need the following tools during the unpacking and installation:

- 2 medium size crescent wrenches
- 3/16” hex key
- 1/4”, 5/16” hex keys (if covers need to be removed)

Floor Preparation For Robotic Pedestals

Before you install the SP-2000/X-Y pedestals, make sure that the floor in your studio is suitable for robotic operation.

For proper robotic pedestal operation, you should consider the following floor specifications when designing the floor for the operating environment:

- Floor leveling - maximum 1/8 inch over 10 ft. (0.3 cm over 3 m)
- Wheel contact floor loading - 500 PSI maximum

The SP-2000/X-Y pedestal uses a Blue Polyurethane 95 Shore “A” wheel tread to provide noiseless, stable operation while affording maximum protection to customers’ floors. Customers should specify floor covering that is consistent with their anticipated frequency of operation under these load conditions. Although Vinten Inc. does not make specific floor recommendations, customers have reported excellent results with self-leveling epoxy over leveled concrete. Other issues that you should consider while specifying floor materials are:

- Wear characteristics and ability to withstand the precise and repetitive movements of free-roaming pedestals
- Surface hardness and potential impact on camera stability and robotic accuracy
- Texture and smoothness of the floor covering, including seams
- Preparation of the subfloor and application of mastics and adhesives. Many floor covering materials conform precisely to the subfloor and faithfully ‘telegraph” effects of imperfections

Removing The SP-2000/X-Y From Its Crate

CAUTION: Do not try to push the pedestal off the base of the crate and down the ramp. You may cause serious electrical and/or mechanical damage.

CAUTION: At least two people are needed to remove the pedestal from the crate.

As shipped from the factory, the on board batteries of the SP-2000/X-Y are fully charged. Therefore, unless the dolly is left crated for an extremely long time, it can be driven off the skid under battery power using the ramp supplied. If you cannot drive the dolly under its own battery power, the alternate procedure described below will require the temporary use of the AC power supply and power/data cable.

Uncrating The Pedestal

1. The shipping crate is re-usable and should be saved for repacking the pedestal or should be shipped back to Vinten. Make sure that you retain the sides, top, ramp, interior brace and the four straps.
2. Release the four straps that hold the crate together by pulling up on the latch on each buckle. Remove the straps.

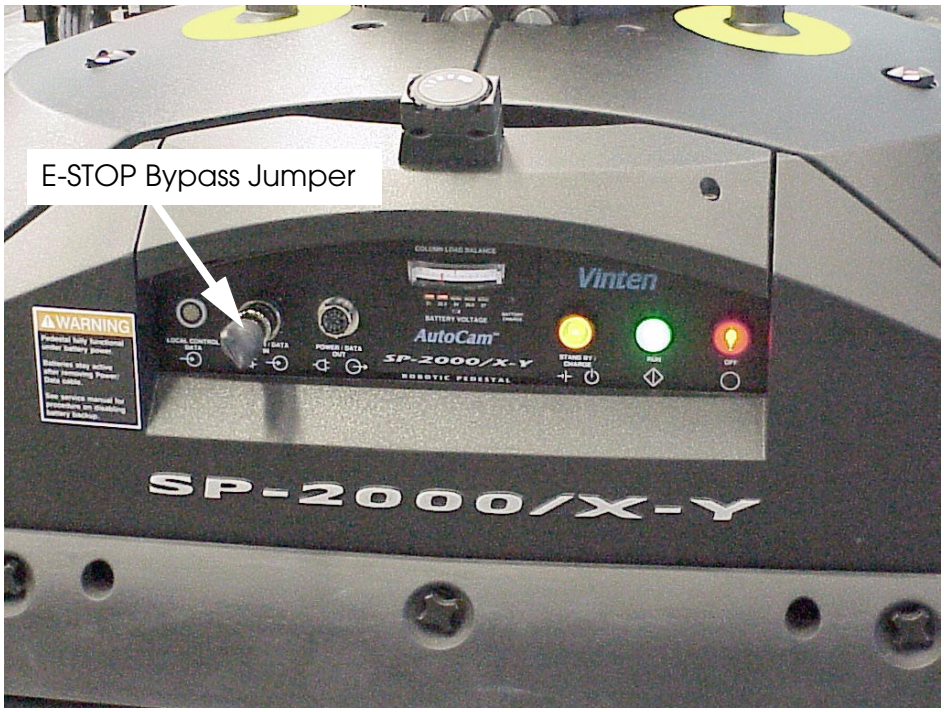
3. Using two or more people, lift the top of the crate and set it aside.

4. Using two or more people, lift the ramp out of the top of the crate. Insert the two pins at the end of the ramp into the mating holes in the base of the crate. Unfold the ramp onto the floor.
5. Remove the four sides of the crate and set them aside.
6. Using two or more people, lift the brace frame up and off the pedestal and set it aside.

7. Remove and set aside any other items (for example the head mounting screws, MCB joystick controller, targets etc.) that were packed inside the pedestal crate.

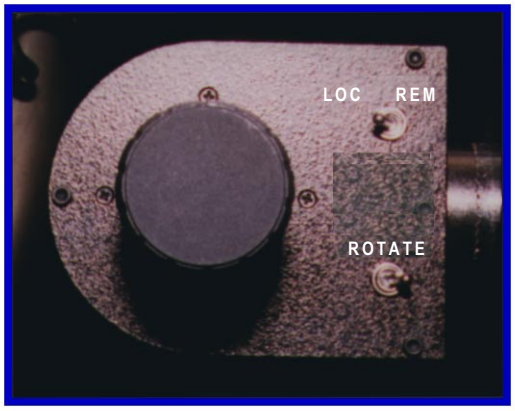
Unloading The Pedestal

1. Twist clockwise on each of the three Emergency Stop Switches to release them (they will pop up when released).
2. Install the E-STOP bypass jumper plug on the Power/Data In connector on the control panel as shown below. Without this jumper plug the E-STOP logic will prevent battery powered operation.



3. The cable skirts around the pedestal base (4 in total) must be raised fully before you drive the pedestal off the base of the crate and down the ramp. For each skirt, loosen the thumbscrews, raise the skirt and tighten the thumbscrews.

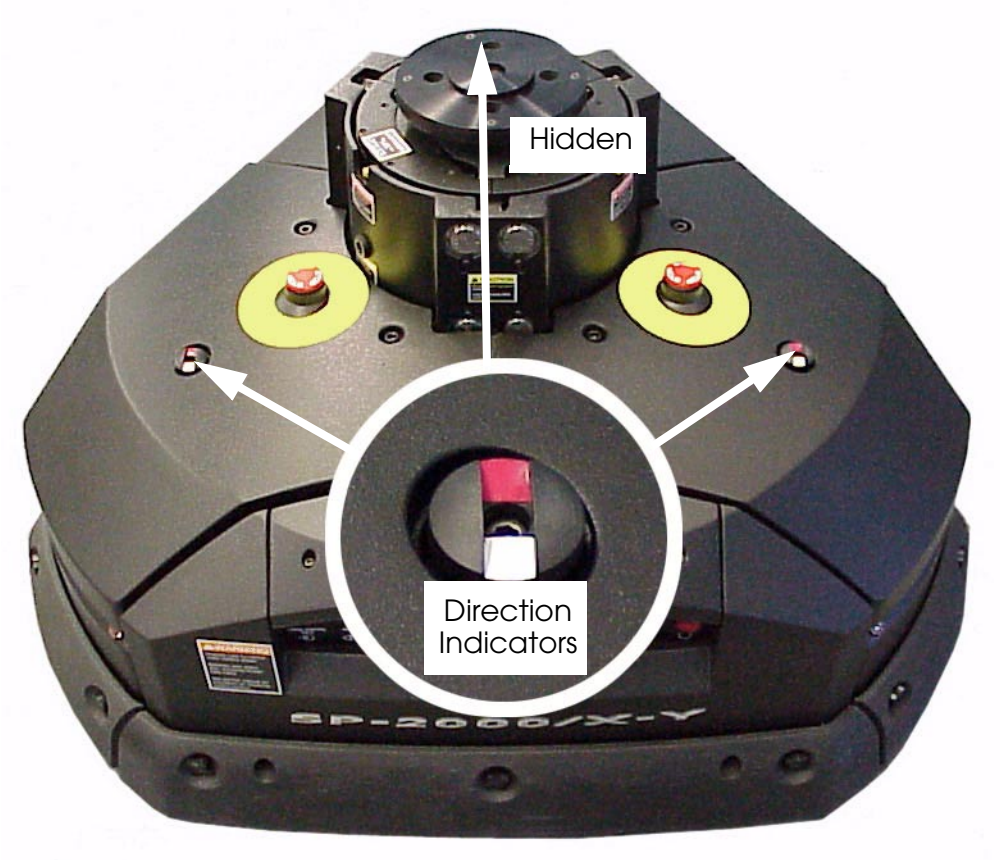
4. Plug the MCB controller cable into the Power/Data MCB connector on the pedestal. Set the Local/Remote switch on the MCB to Remote.



WARNING: The MCB controller MUST always be in Remote when you turn on the SP-2000/X-Y pedestal.

5. Press and hold the Standby/Charge (yellow) button on the pedestal until the light comes on and stays on. If the batteries are discharged (typically below 24V on the control panel voltmeter) and the pedestal will not turn on, refer to AC Powered Unloading below.
6. Press the Run (green) button on the pedestal and the light will come on and the pedestal circuits will initialize. Wait about 30 seconds until all three wheels have initialized (the North wheel is first, followed by the West wheel then the East wheel) before moving on to the next step.

7. Switch the Local/Remote switch on the MCB controller to Local. Set the Rotate switch on the MCB controller to Drive (switch handle pointing towards the joystick) and check to make sure that the direction indicator for each wheel is pointing forwards/backwards (in line with the ramp).



8. Gently pull back on the joystick to drive the pedestal towards the ramp. Push the joystick left or right as needed to keep the pedestal centered on the ramp.
9. Slowly drive the pedestal down the ramp and onto the studio floor. Note: Even with the cable skirts raised, they may hang up on the top and bottom of the ramp. If this happens, have an assistant pull up slightly on the pedestal so that the skirt will clear.

AC Powered Unloading

1. Connect the Power/Data Cable from the power supply Power/Data Out connector to the Power/Data In connector on the pedestal. If the power supply is not yet mounted in the rack, you can place it close to the crate for convenience.
2. Temporarily install the E-STOP jumper plug (normally installed on the last E-STOP box in the loop) into the E-STOP LOOP connector on the power supply.
3. Connect the power supply AC cord and turn on the power supply.

4. Continue with steps 3 through 9 above.

After the pedestal is unloaded, and with this temporary power supply connected, leave the pedestal in Standby/Charge mode overnight to charge the batteries. Then you will be able to drive the pedestal to its final location using battery power.

Or, if the pedestal is already in its final location, you can continue with mounting the head, pressurizing the pedestal and the electrical installation.

Remove the E-STOP jumper plug from the power supply.

Mounting The Pan/Tilt Head & Payload

The four screws to attach the head to the pedestal column should have been removed from the pedestal crate earlier.

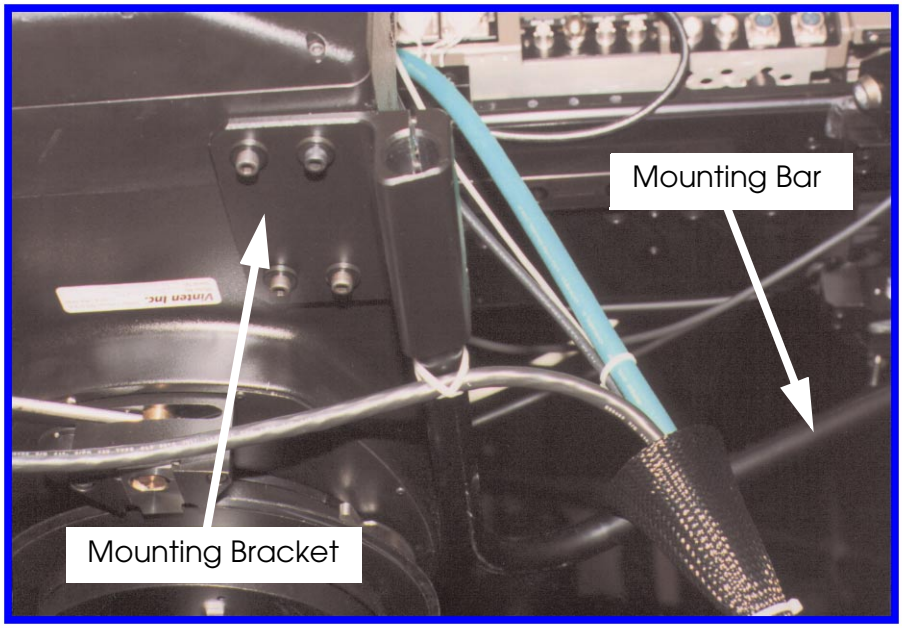
1. With the MCB controller in Local, twist the joystick to lower the column to its minimum height. Since the column is not balanced, you may need to help the servo by pushing down on the column.
2. Switch the MCB controller to Remote.
3. Press the Stop button on the pedestal control panel to power it down.
4. Position the screws in the holes in the mounting plate at the top of the column.

5. Refer to the User Manual for the Pan/Tilt Head for specific instructions on mounting the head and payload.

CAUTION: After mounting the head and payload, NEVER try to raise or lower the column until the pedestal has been pressurized - see the next section of this chapter.

MCB Controller Mounting

After the pan/tilt head is mounted, the MCB controller is mounted to a right angle bar that is attached to the head.



1. Attach the mounting bracket to the bottom of the head using the four screws and flat washers provided. Tighten the screws with a 3/16” hex key.
2. Insert the right angle mounting bar into the bracket and tighten the clamp screws with a 3/16” hex key. The final positioning of the bar (left/right and up/down) will depend on the camera position and can be adjusted later.
3. Mount the MCB controller on the bar and tighten the clamp.
4. Plug the MCB controller cable into the Local Control Data connector on the SP-2000 control panel.

Pressurizing And Balancing The Pedestal

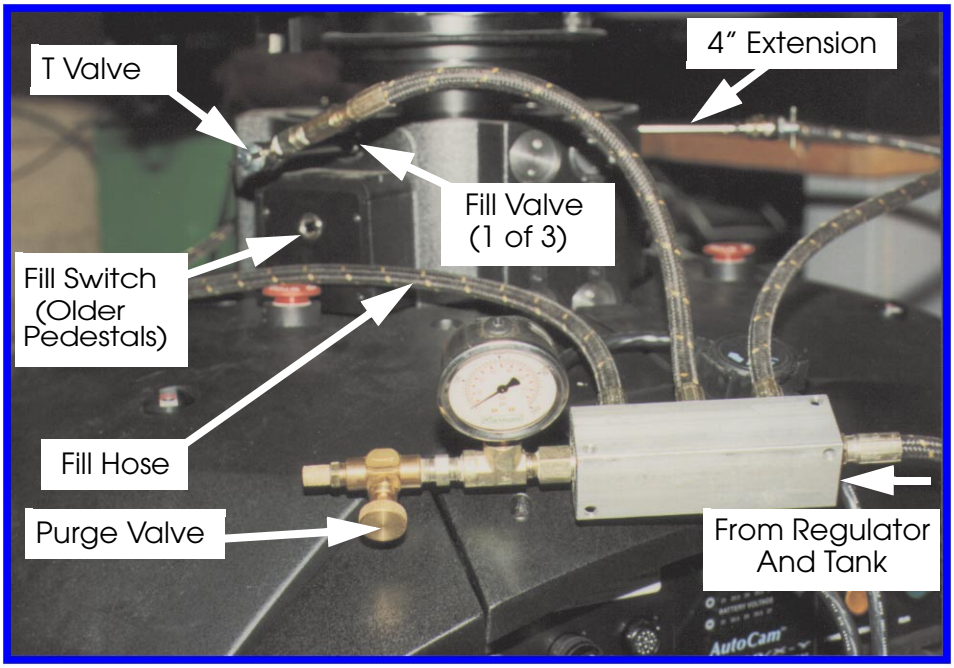
It is recommended that three people be available for this procedure.

DANGER: STRICT ADHERENCE TO THESE PROCEDURES IS CRITICAL IN ORDER TO AVOID ANY BODILY INJURY TO PERSONNEL. ALL PERSONNEL WORKING ON OR NEAR THE PEDESTAL MUST BE TRAINED, AWARE OF THE CORRECT PROCEDURES AND AWARE OF THE HAZARDS INVOLVED.

DANGER: THE MAXIMUM CYLINDER PRESSURE IS 1,250 PSI (86 BAR).
USE ONLY THE VINTEN SUPPLIED MANIFOLD FOR ADJUSTING PRESSURE.

Pressurizing The Pedestal

1. Make sure that the column locking pins are NOT installed - this will allow the column to rise as the pressure is increased.



2. Connect the input hose and regulator to the nitrogen tank. Close the regulator valve fully. Close the purge valve on the manifold and turn the three T valves fully CCW.
3. Remove the yellow dust caps from the three fill valves on the column.
4. Install a 4" valve extension (packed separately) onto each fill valve. Tighten the extensions with a crescent wrench - but do not overtighten.
5. Connect a fill hose to each valve extension. Use one crescent wrench to hold the valve extension steady and use a second crescent wrench to tighten the fill hose fitting. Open each T valve by turning it fully clockwise.
6. With the regulator fully closed (turn CCW), open the main valve on the nitrogen tank.
7. Press and hold the Standby/Charge (yellow) button on the pedestal until the light comes on and stays on.
8. If you have an older pedestal with a Fill Switch as shown opposite, press and hold the switch while the pedestal is being pressurized, until the pedestal is powered up in step 11. (In newer pedestals, a set of contacts on the Standy/Charge switch perform the function of the Fill Switch)
9. Start increasing the pressure setting on the regulator (turn CW). At approximately 900 psi (63 bar) you will hear a hissing sound indicating that the three holding chambers are being filled. Keep the regulator set just high enough to keep the nitrogen flowing but no higher. Listen for leaks at the fittings, tighten as needed.
10. Have an assistant pull up gently on the payload and column (with around 20-30 lb. of force) from time to time. Make sure that you support and lift the manifold and fill hoses as the column rises to avoid straining the valve extensions. Make sure that the hoses do not get caught as the column rises. Keep nitrogen flowing until the column starts rising on its own and then immediately close the regulator (turn CCW) to prevent overfilling.
11. Close the main valve on the nitrogen tank completely.
12. Be prepared for the column to go up and down during initialization. Press Run to power up the pedestal.

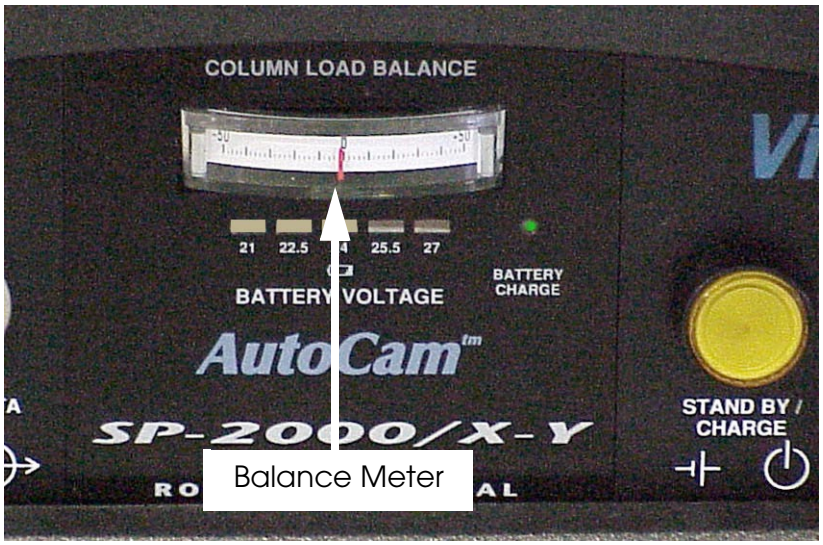
Balancing The Pedestal

Balancing can only be done with the full payload mounted.

CAUTION: If the payload is changed for any reason, the column must be rebalanced.

The column balance should be checked daily. If gas needs to be added after a balance check, use the procedure in the previous section.

1. Switch the MCB controller to Local mode and twist the joystick to raise the column to approximately the middle of its range. Make sure that all cables and equipment such as the prompter are in their normal operating positions.
2. Twist the MCB joystick to move the column up and down slowly around its mid point and watch the balance meter on the rear panel of the pedestal.



3. If the column is balanced, the meter deflection will be equal in both directions. If the deflection is greater when the column is raised, the pressure is too low and gas should be added (use step 4). If the deflection is greater when the column is lowered, the pressure is too high and gas should be discharged (use step 5).
4. Briefly open the main valve on the gas tank to add gas and then recheck balance. Continue adding a little gas at a time until balance is achieved. Go to Finishing Up.
5. Briefly open the Purge Valve on the manifold to release a little gas and then recheck balance. Continue releasing a little gas at a time until balance is achieved. Go to Finishing Up.

Finishing Up

1. Close the three T valves (turn CCW) at the ends of the fill hoses.
2. Make sure the main valve on the tank is closed and then open the Purge Valve to relieve the pressure in the manifold and fill hoses.
3. Use a crescent wrench to hold the valve extension steady and use a second crescent wrench to remove the fill hose fitting from the extension. Remove the valve extension from the fill valve on the pedestal.
4. Repeat for the other two valve extensions and fill hoses.
5. Replace the three yellow valve caps.

Discharging The Pedestal

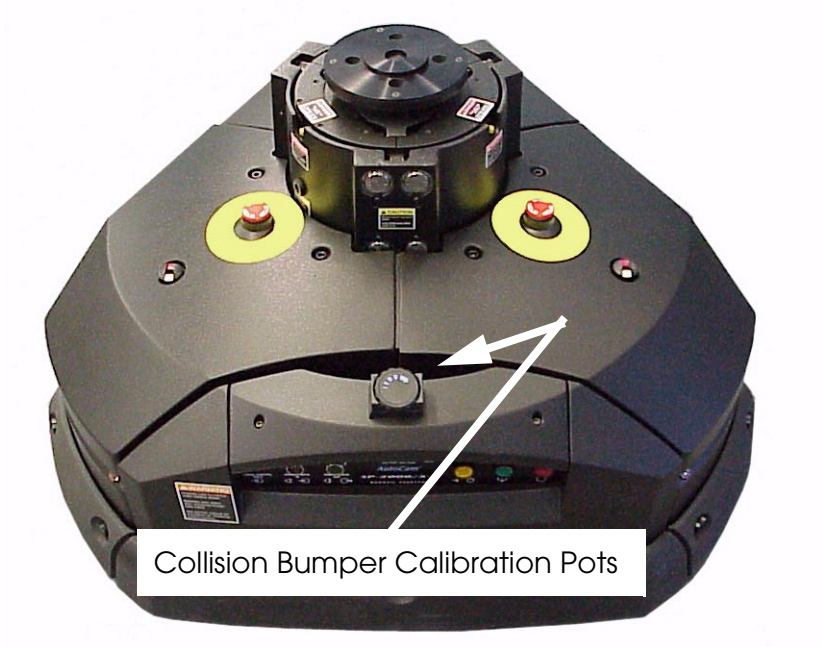
To discharge the pedestal (to ship it for example):

1. Lower the column to its minimum height and power down the pedestal.
2. Follow steps 1-4 of Pressurizing The Pedestal earlier in this chapter.
3. Close the regulator completely, close the purge valve on the manifold and open the three T valves (turn CW) at the ends of the fill hoses.
4. Slowly open the purge valve and allow the gas to escape.
5. When the pressure reading on the manifold gauge is below 30 psi (2 bar), close the purge valve.
6. Close the three T valves (turn CCW) at the ends of the fill hoses.
7. Open the Purge Valve to relieve any remaining pressure in the manifold and fill hoses.
8. Use a crescent wrench to hold the valve extension steady and use a second crescent wrench to remove the fill hose fitting from the extension. Remove the valve extension from the fill valve on the pedestal.
9. Repeat for the other two valve extensions and fill hoses.
10. Replace the three yellow valve caps.

Calibrating The Collision Bumpers

Ignore this section if your pedestal has the electromechanical type of bumper. See page 1-7 if you are not sure which type of bumper you have.

Before the SP-2000/X-Y is put into service it is essential for safety reasons that the collision bumper detection circuits are calibrated. Each cable skirt (4 total) has an internal collision detector. All four detectors are connected to the detector circuit board mounted just below the cable clamp.

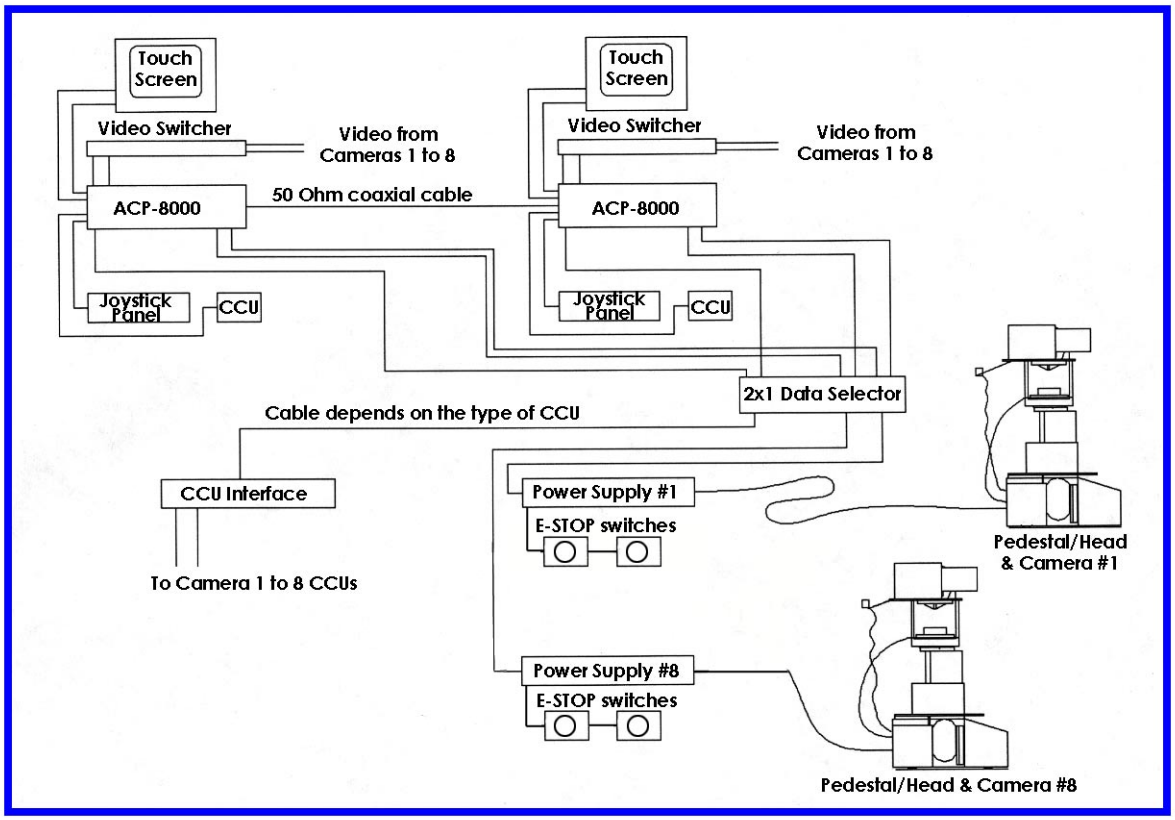


Use the calibration procedure in chapter 4.

This page left blank intentionally.

Electrical Installation And Interconnection

A typical AutoCam system configuration is shown below..

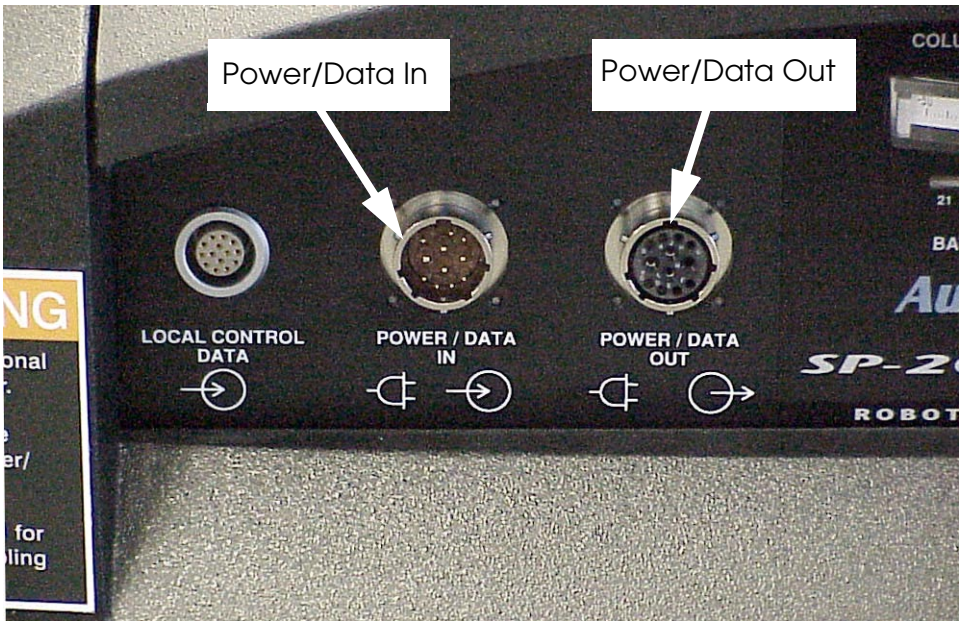


1. Refer to the User Manuals for the controller, the pan/tilt head and other equipment for relevant installation instructions.
2. The rackmount power supplies are installed up to 260 ft. (80 m) from their respective pedestals - refer to the User Manual for the power supply for additional information.

3. Install an E-STOP switch for each pedestal at a convenient location close to the joystick panel. If you are using dual controllers, install a second E-STOP switch for each pedestal at the second controller location.

4. Clearly label the E-STOP switches so that the operator can see at a glance which switch connects to each of the pedestals.
5. Connect the E-STOP cable from the E-STOP loop connector on power supply #1 to E-STOP switch #1.
6. If you have a single controller, install the E-STOP jumper on the open connector on E-STOP switch #1. If you have a sencond controller, connect another E-STOP cable from the first E-STOP switch #1 to the second E-STOP switch #1 and install the E-STOP jumper on the second switch.
7. Repeat steps 5 and 6 for the other pedestals.

8. Run the power/data cable from the power supply through the cable clamp on the pedestal base to provide strain relief. Loop the cable to the Power/ Data In connector on the SP-2000/X-Y rear panel. Run the power/data cable alongside the camera triax (or multicore) cable and any other cables that connect to the camera system in your installation.



9. You may want to use a light weight jacketing material for the cable bundle to each pedestal. Several customers have reported that a product called “Flexo” works well. Flexo is sold in several diameters (1.25” is usually a good choice) and is available from:

Techflex Inc.
50 Station Road
Sparta NJ 07871
Phone: +1 973-729-6253
Fax: +1 973-729-9320

You may want to include a rope in the cable bundle to add bulk and make it easier for the pedestals to push the bundle out of the way as they move around.

10. Connect the power/data cable from the Power/Data Out connector on the SP-2000/X-Y rear panel through the cable clamp to the pan/tilt head.
11. Tighten the cable clamp.

The installation of the AutoCam targets which are required for automated operation is covered in the User Manual for your controller (e.g. ACP-8000P).

The SP-2000/X-Y is now ready for operation. Refer to Chapter 2 of this manual and the User Manual for your controller.

Removing The Payload

WARNING: ALWAYS lower the column to its minimum height, power down the pedestal and install the locking pins before removing all or part of the payload. Or, discharge the pressure in the pedestal (see Discharging The Pedestal earlier in this chapter). This will prevent column from rising unexpectedly and causing injury and/or damage.

CAUTION: NEVER try to raise or lower the column if the locking pins are installed, You will cause serious mechanical and/or electrical damage.

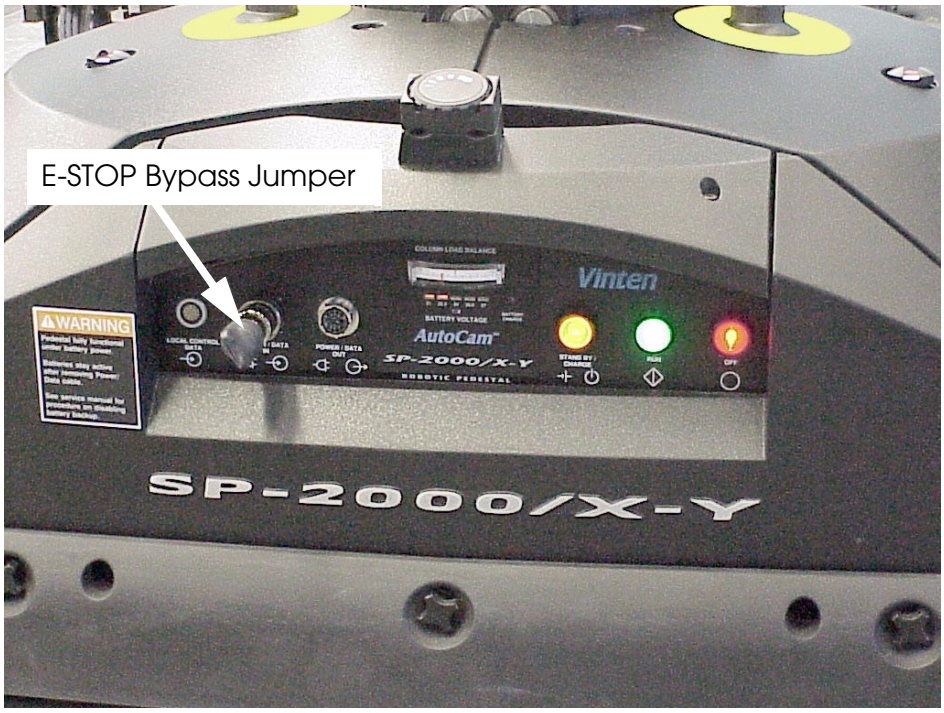
Refer to the documentation for the payload equipment and the User Manual for the pan/tilt head for specific instructions.

This page left blank intentionally.

Recrating The Pedestal

If you do not have a crate, contact Vinten for a replacement.

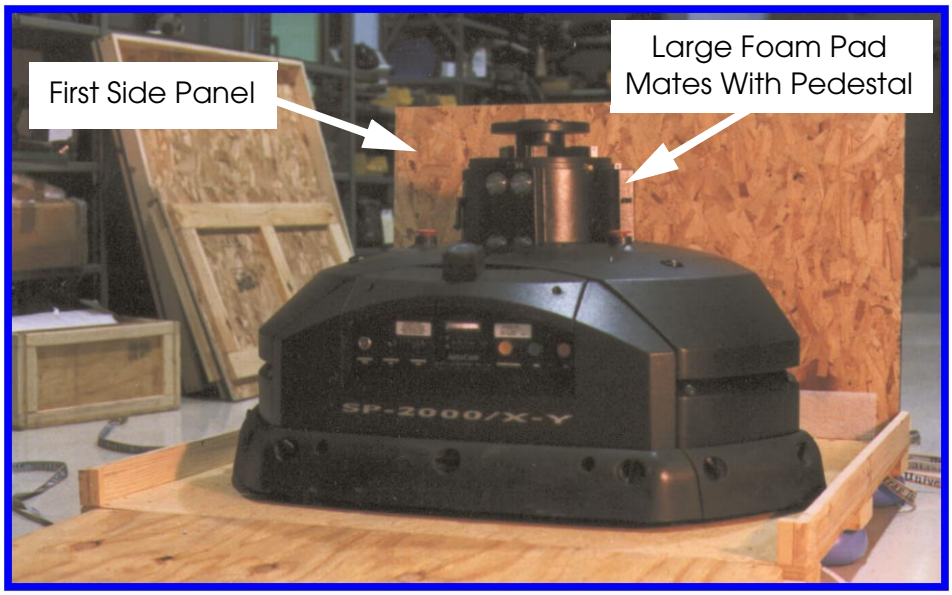
1. Use the MCB controller joystick to lower the column to its minimum height.
2. Press the Off button on the pedestal to power down the pedestal.
3. Disconnect the Power/Data cable from the power supply to the pedestal, and the Power/Data cable from the pedestal to the pan/tilt head. Leave the MCB controller connected to the pedestal.
4. Install the E-STOP bypass jumper plug on the Power/Data In connector on the control panel as shown below. Without this jumper plug the E-STOP logic will prevent battery powered operation.



5. The pressure in the column must be reduced to less than 30 psi (2 bar) before the pedestal can be crated - see Discharging The Pedestal earlier in this chapter.
6. Remove each element of the payload (lens, camera, teleprompter, head etc.). Refer to the User Manuals for the payload equipment and the pan/tilt head for specific instructions.

Crating The Pedestal

1. Place the base of the crate close to the pedestal, leaving room for the ramp.
2. Using two or more people, insert the two pins at the end of the ramp into the mating holes in the base of the crate. Unfold the ramp onto the floor.
3. Install the first side panel of the crate (with the large foam pad) as a guide to help you position the pedestal on the base.



4. The cable skirts around the pedestal base (4 in total) must be raised fully before you drive the pedestal up the ramp onto the crate base. For each skirt, loosen the thumbscrews, raise the skirt and tighten the thumbscrews.
5. With the MCB controller in Remote, press and latch Standby/Charge, and then press Run.
6. Allow 30 seconds for the pedestal circuits to initialize.
7. Switch the MCB controller to Local and Drive mode. Drive the pedestal to the base of the ramp. Use Rotate mode to line up the pedestal with the ramp. As shown in the photo on the previous page, the North side of the pedestal goes up the ramp first.
8. Carefully drive the pedestal up the center of the ramp. Note: Even with the cable skirts raised, they may hang up on the bottom of the ramp and also at the top. If this happens, have an assistant pull up slightly on the pedestal so that the skirt will clear.
9. When the pedestal is correctly positioned on the base of the crate, switch to Rotate mode on the MCB controller and then switch to Remote. Push down and latch all three Emergency STOP switches.
10. Remove the E-STOP bypass jumper plug.

11. Push the column down to its minimum height and disconnect the MCB controller from the pedestal control panel.
12. Using at least two people, install the brace frame onto the top of the pedestal column.
13. Install the three remaining sides of the crate, matching the foam padding to the shape of the pedestal.
14. Using at least two people, install the top of the crate.
15. Insert the four straps in the cut outs in the top of the crate. Pull the each strap hand tight and then close the latch to tension the strap.

4 Maintenance And Repair

Safety

Safety issues including important warnings, risks and related topics a re covered in Chapter 1 of this manual. It is very important that all personnel who work on or near the Autocam equipment read this safety information. The warnings are summarized here - refer to Chapter 1 for more details.

WARNING: ALWAYS set the column to its minimum height, turn power off and engage the two locking pins in the base of the column before removing the camera or payload equipment from the head. Or, discharge the gas from the pedestal.

WARNING: NEVER work directly under the camera if the column is raised. In the unlikely event that the gas pressure supporting the column is lost, the head and payload may drop quickly.

CAUTION: NEVER attach cables to the head or the camera which could pull the pedestal over if it is moved with the column extended.

CAUTION: Depending on your choice of equipment, the payload in your application may be over 300 lb (over 136 kg). Therefore, to avoid personal injury, or injury to others, we recommend that each element of the payload (teleprompter, lens, camera etc.) be removed separately. ALWAYS follow the handling instructions supplied by the manufacturers of the payload equipment. Make sure that you have enough people involved to safely handle the weight of your payload equipment.

Other Important Information

1. To avoid personal injury, always exercise caution when working in the vicinity of energized pedestals as they can start to move without any warning.

2. Unless it is impossible, you should always de-energize the pedestal and head before working on any part of the pedestal, the head, the camera/lens, or any associated equipment.

Customer Responsibility

It is the customer's responsibility to ensure that the workplace is safe. In normal operation, the remote controlled pedestals, heads and payloads in an AutoCam system can move suddenly and without warning. Since audible warnings are out of the question in normal television applications, it is recommended that only trained personnel be allowed to work in the active areas where the remote controlled pedestals, heads and payloads are located. As part of the training, personnel must be made aware of the hazards of working in a robot environment, including the specific hazards listed below. The forces are sufficient to cause personal injury, or injury to others and therefore, caution is essential.

Pedestals And Heads Can Start Unexpectedly

The hazards associated with robotic camera systems are only slightly different than those associated with operating a camera under conventional manual control. The speeds and camera weights are similar. The main difference is that with automation, the operator is normally not near the cameras, and it is more difficult to verify that the area is clear. For personnel working on or near the pedestals, they must be aware that the equipment can start moving unexpectedly.

All personnel should be trained and aware of the hazards of robotic pedestals and heads, and the fact that they can move at any time. They must be trained on how far the pedestals, heads and payloads can move, the speeds involved, and the need to stay back an appropriate distance.

Most adjustments to the camera and head, such as balancing and camera calibration, should be made with the system de-energized. However, if adjustments are absolutely necessary while the pedestal and/or head is powered, they should only be made by trained technical personnel familiar with the AutoCam robotics system. They must understand that the pedestal or head can move unexpectedly at any time, and they must position themselves so that any motion would not cause them personal harm.

When the robotic heads move, the speeds involved are fairly slow. However, the equipment is still capable of generating sufficient force to cause injury. Therefore, it essential that you exercise caution. In particular, be aware that the teleprompter is usually the fastest swinging element.

Any failure of the system could possibly cause one or more axes to move on their own, but the speeds and forces should not be noticeably greater than those encountered during normal use.

Pinch Points

Particular care should be exercised around possible points where you could get pinched, such as the tilt cradle. Here, the forces can be somewhat greater, due to the short lever arm.

Sharp Edges

If the lens, teleprompter or other camera attachments have sharp edges that could cause injury, make sure they are padded or protected.

This page left blank intentionally.

Routine Maintenance

The SP-2000/X-Y is a highly reliable and stable product. Many of the mechanical components are sealed and permanently lubricated. The electronics are well ventilated and highly rated. The number of connectors is kept to a minimum and the best quality connectors are utilized. All this adds up to a product that does not require much general routine maintenance.

However, a few preventive maintenance procedures and routine operational checks will reduce the likelihood of problems occurring in normal operation. The procedures are described in detail following the summary chart.

Topic	Daily	Monthly	As Required
Clean The Targets	X		
Check DC Power	X		
Check Column Balance	X		
Check Overall Operation	X		
Test Emergency Stop Switches		X	
Test Collision Bumper Operation		X	
Clean The Target Sensors		(X)	X
Clean The Slip Rings		X	
Examine The Wheels		X	

Cleaning The Targets

It is very important to keep the targets clean to ensure repeatable targeting. It is recommended that you clean the targets every day. The top surface of the target is clear lexan which can be cleaned with any standard household cleaner such as Fantastic or 409.

Removing Targets

If a target is damaged, or the studio configuration is changed, targets will need to be replaced. Peel up one corner with a razor blade and try to keep the adhesive on the back of the target, not on the floor. Slowly pull the target off the floor. Small areas of adhesive left on the floor can be removed carefully with a razor blade or by rubbing back and forth with your finger. To move larger areas of adhesive from the floor before you install the new targets, you can use:

- A 50/50 solution of isopropyl alcohol and water
- A slightly more aggressive cleaner called “Citrus Based Cleaner” is available from 3M Company (1-800-524-0399)

- A more aggressive product called “Oil-Flo” is available from Titan Chemical (1-800-475-3300 or 1-415-965-9900)

DC Power

Every day when you power up the pedestal, check that the green Battery Charge LED on the control panel is On (dual LEDs for positive and negative voltages in older systems). This confirms that the rack mounted power is on and supplying dc power to the pedestal.

Column Balance

Every day when you power up the pedestal, check the column balance. Column balance must be checked with the normal payload mounted.

1. After initialization is complete, switch the MCB controller to Local and twist the joystick to raise the column to approximately the middle of its range.
2. Make sure that all cables and equipment such as the prompter are in their normal operating positions.
3. Move the column up and down slowly around its mid point and watch the balance meter on the rear panel of the pedestal. The meter deflection will be equal in both directions if the column is balanced.
4. If the deflection is greater when the column is raised, the pressure is too low and gas should be added. Conversely, if the deflection is greater when the column is lowered, the pressure is too high and gas should be discharged. Refer to Pressurizing The Pedestal in Chapter 3 if the column is not balanced.
5. Switch the MCB controller to Remote to return control to the controller.

Overall Operation

1. Switch the MCB controller to Local and use the joystick to verify that the pedestal drive, steer and height operate smoothly and consistently throughout the entire range.
2. Switch the MCB controller back to Remote.
3. Check the operation of pan, tilt, zoom, focus from controller.

E-STOP Switch Operation

For obvious safety reasons, it is essential that the E-STOP switches at the controller locations and the three E-STOP switches on the pedestal base are always functioning correctly. It is recommended that you check the switches once a month.

1. With pedestal#1 in Run mode, press down the E-STOP switch at the controller and verify that the pedestal immediately turns off.
2. Pull up the E-STOP switch to release it.
3. Press Standby/Charge on Pedestal #1 until it latches and then press Run to power up the pedestal.
4. If you have a second controller, repeat steps 1, 2 and 3 for the E-STOP switch at the second controller.
5. With pedestal#1 in Run mode, press down the first E-STOP switch on the pedestal base and verify that the pedestal immediately turns off.
6. Twist the E-STOP switch clockwise to release it.
7. Press Standby/Charge until it latches and then press Run to power up the pedestal.
8. After the pedestal has initialized, repeat steps 5, 6, 7 for the other two E-STOP switches.
9. Repeat steps 1 through 8 for the other pedestals.

Collision Bumper Operation

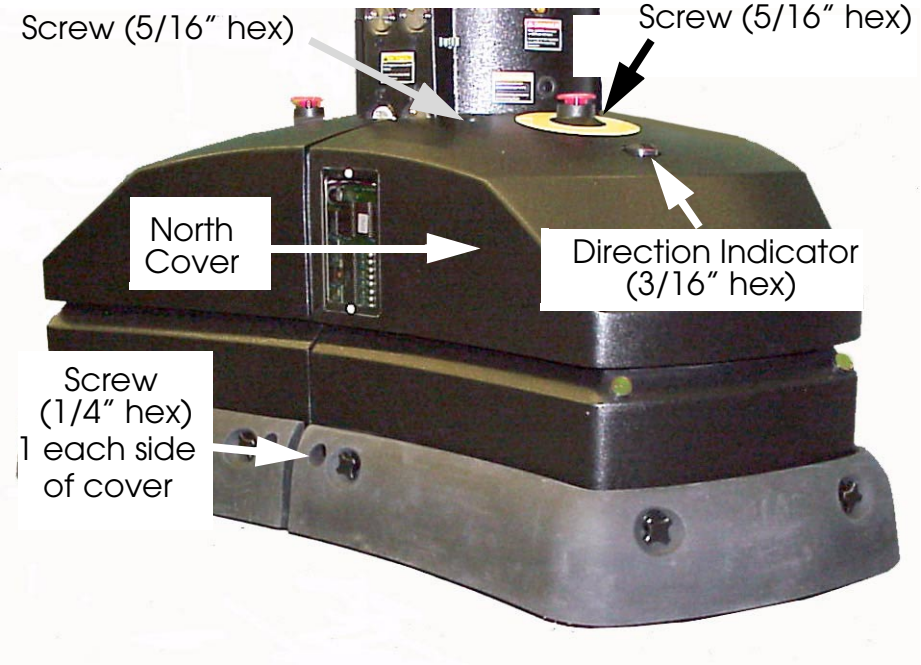
For safety reasons it is essential that the collision bumpers on the pedestal base are operating correctly at all times. It is recommended that you check the bumper circuit operation at least once a month.

1. Locate the bumper detector circuit board mounted just below the cable clamp on the rear of the pedestal. The board has a pot and LED indicator for each of the four bumpers. All four LEDs should be a steady green. If not, the circuit must be calibrated as described on page 4-18.
2. Observe the LEDs while an assistant presses firmly on the first bumper with his hand or foot. The corresponding LED should turn red as the bumper is pressed and back to green when it is released. If not, the circuit must be calibrated as described on page 4-18.
3. Repeat these steps for the other three bumpers.

Removing The Covers

The North Cover

1. Press the Stop button to power down the pedestal
2. Use a 3/16” hex key to remove the direction indicator for the North wheel.



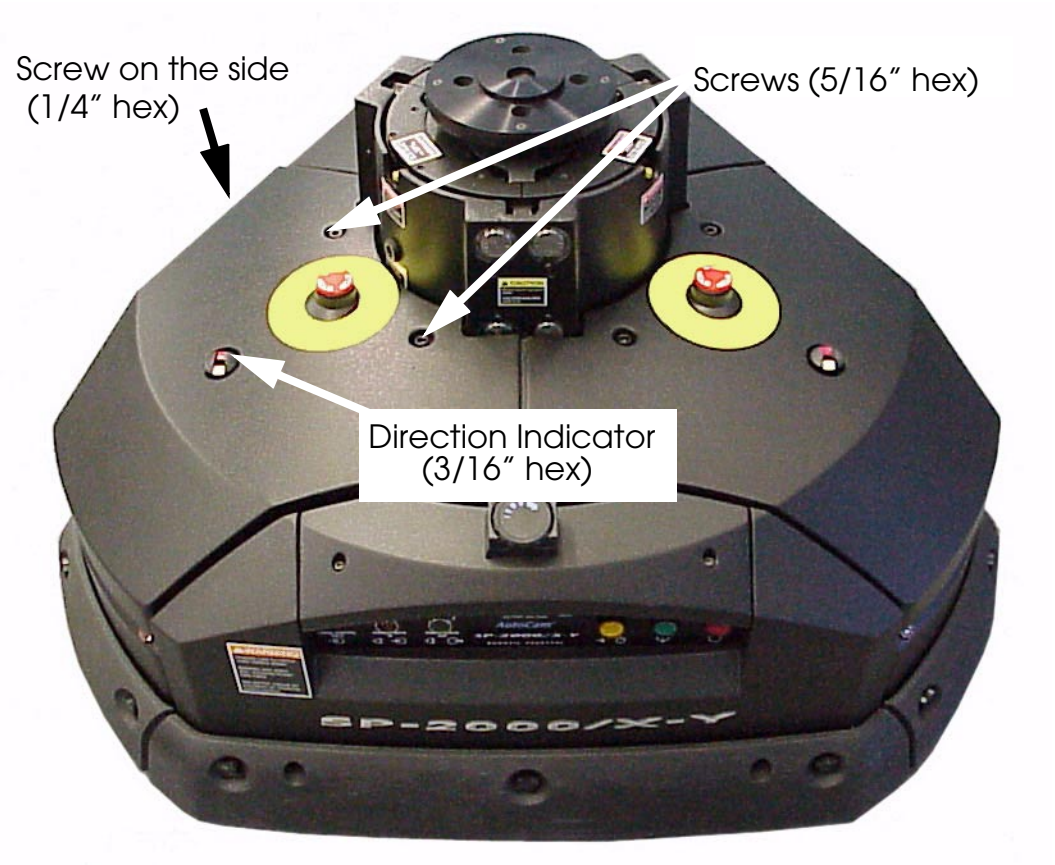
3. Use a 1/4” hex key to remove the two screws in the sides of the North wheel cover.
4. Use a 5/16” hex key to remove the two screws in the top of the North cover.

When you remove any of the wheel covers, lift the cover up and off carefully. Otherwise you may damage the electrical harnesses that are attached to the cover, or other hardware under the cover. Ue similar caution when you replace the cover.

5. Have an assistant close by to disconnect the E-Stop switch harness and bumper sensor harness. Carefully lift the cover up and off a few inches, disconnect the E-Stop harness connector and the bumper sensor connector.
6. Remove the cover.

The West Wheel Cover

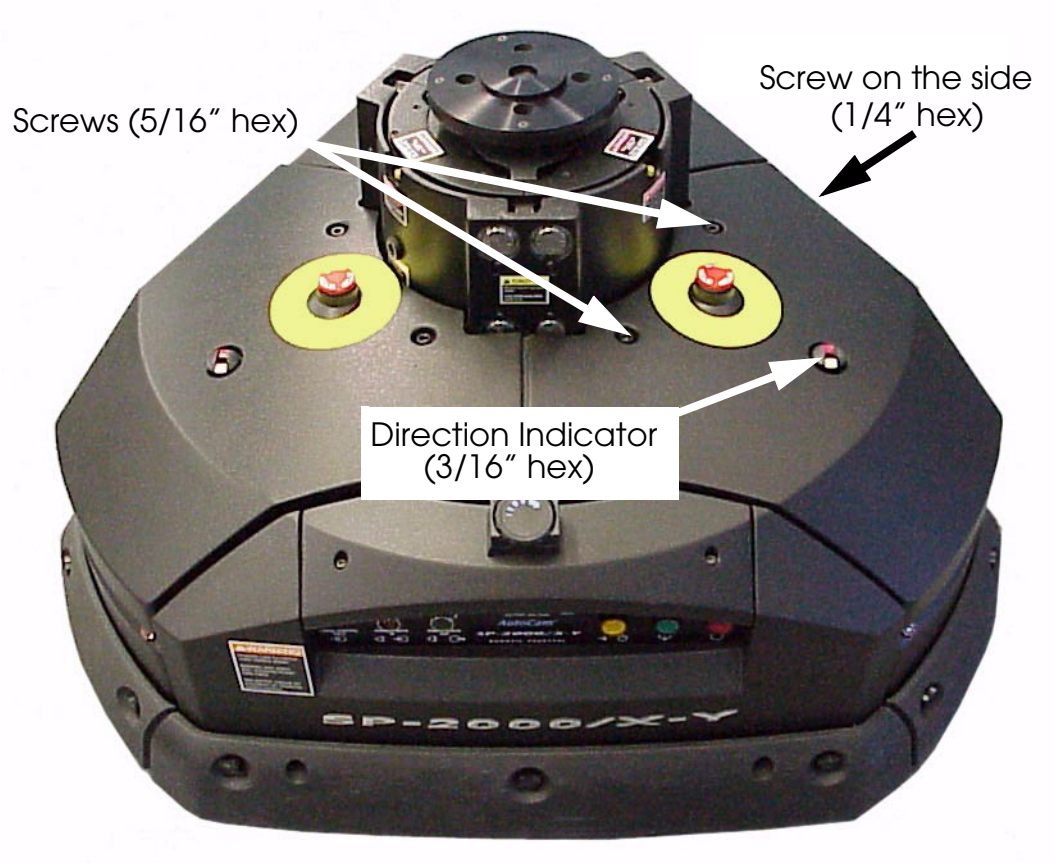
1. Use a 3/16” hex key to remove the direction indicator for the West wheel.



2. Use a 1/4” hex key to remove the screw in the side of the West wheel cover.
3. Use a 5/16” hex key to remove the two screws in the top of the West cover.
4. Have an assistant close by to disconnect the E-Stop switch harness and bumper sensor harness. Carefully lift the cover up and off a few inches, disconnect the E-Stop harness connector and the bumper sensor connector
5. Remove the cover.

The East Wheel Cover

1. Use a 3/16” hex key to remove the direction indicator for the East wheel.



2. Use a 1/4” hex key to remove the screw in the side of the East wheel cover.
3. Use a 5/16” hex key to remove the two screws in the top of the East cover.
4. Have an assistant close by to disconnect the E-Stop switch harness and bumper sensor harness. Carefully lift the cover up and off a few inches, disconnect the E-Stop harness connector and the bumper sensor connector
5. Remove the cover.

Replacing The Covers

Install the East and West covers first and then install the North cover.

1. Have an assistant close by to connect the E-Stop switch harness and collision bumper harness as you replace each cover. Position the cable to the back of the gear box as the cover is installed. Take care when installing the covers to prevent damage.
2. Install the two screws on the top (5/16” hex key) of the cover.
3. Install the screw on the side (1/4” hex key) of the cover (two side screws for the North cover).
4. Make sure the cover fits correctly and tighten all of the screws.
5. Install the direction indicator on each wheel and tighten the screw (3/16” hex key).

This page left blank intentionally.

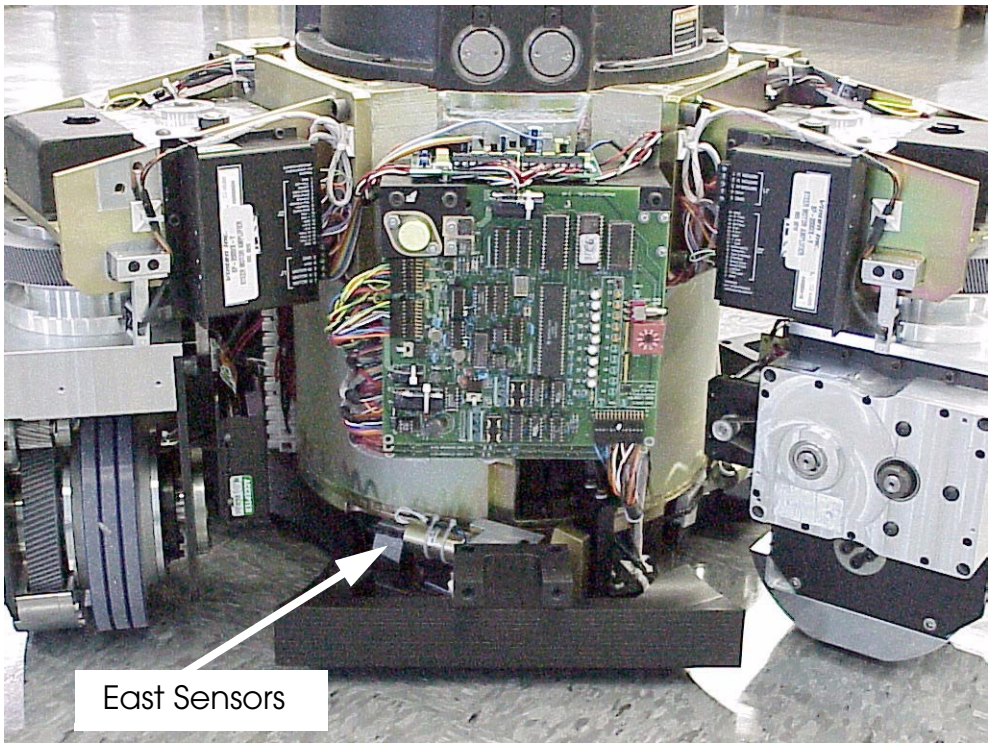
Cleaning The Target Sensors

For consistent, accurate targeting, it is important to keep the sensors clean. If a pedestal has to be commanded to target two or three times before it succeeds, it is likely that the sensors need cleaning.

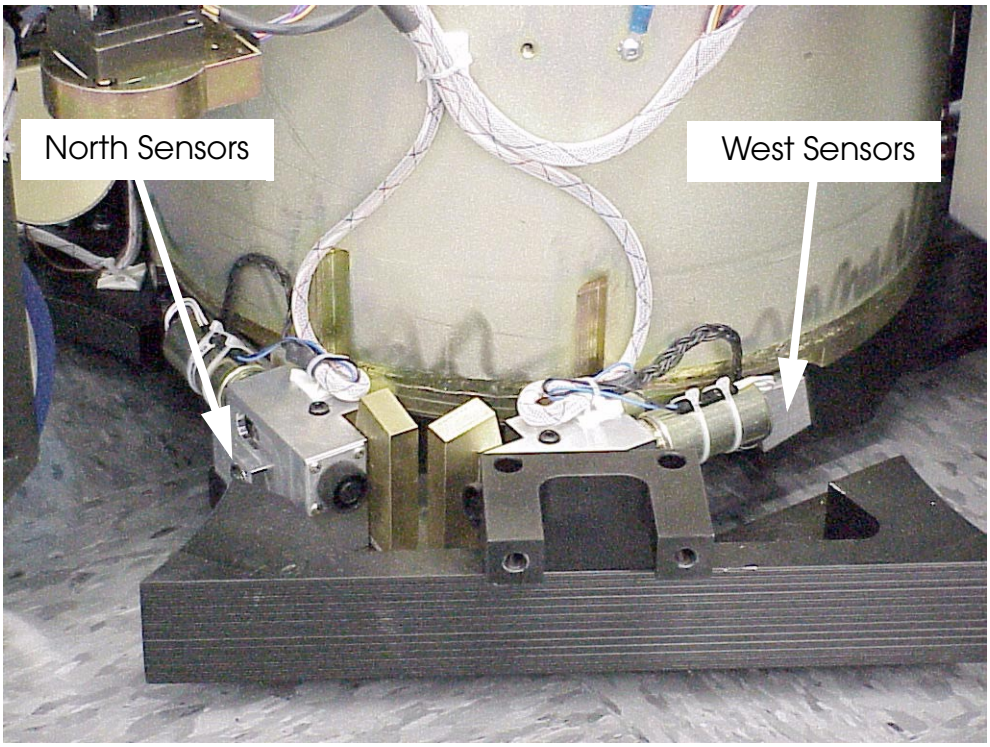
The frequency of cleaning depends on the general cleanliness of your studio - every 3-4 weeks is common, less frequently in a very clean studio. Monitor the targeting performance over the first couple of months of use. If targeting starts to be erratic after say four weeks, you should clean the sensors every three weeks. If ten weeks go by before targeting is erratic, clean the sensors every 8 weeks.

The sensors must always be cleaned before sensor calibration (described later).

1. Remove the three wheel covers as described in the previous section.
2. Locate the sensor assemblies - each is at the base of the pedestal on the end of a counter balanced arm that is activated by a solenoid. The location of the East sensors are shown below and the North and West sensors are shown opposite



3. The sensors are recessed inside the sensor block and do not touch the floor directly. Use a dry cotton swab (Q-Tip) or one moistened with 91% pure (or greater) Isopropyl Alcohol (typically used for cleaning of VTR heads) to clean the three sensors on the East sensor assembly.
4. Repeat for the North and West sensor assemblies.

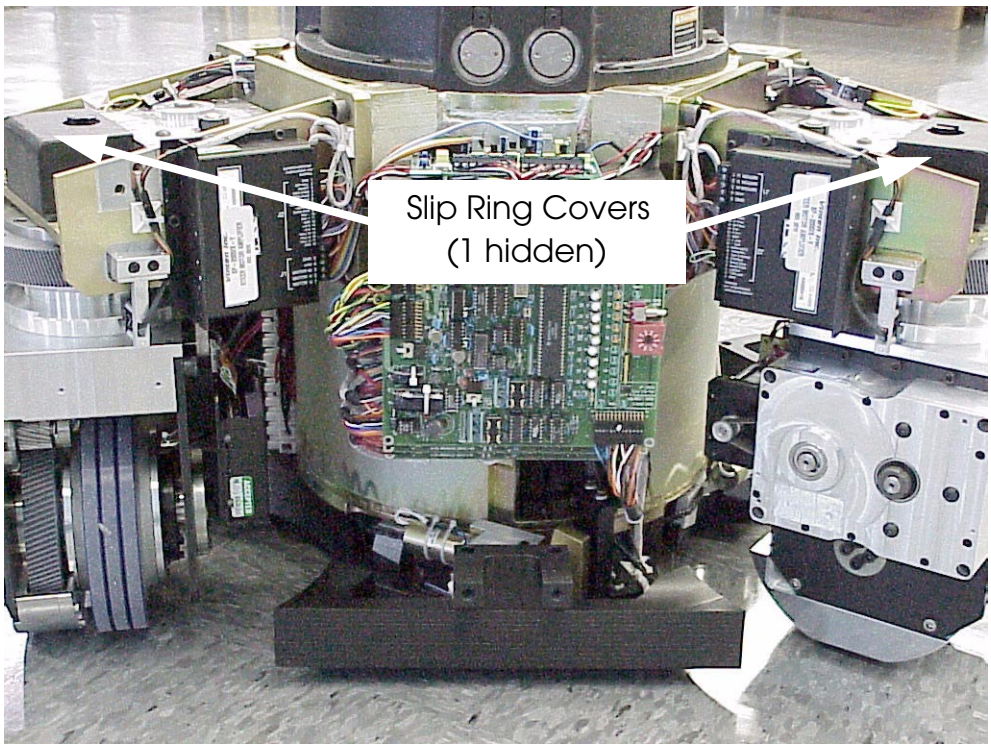

North Sensors
West Sensors

Cleaning The Slip Rings

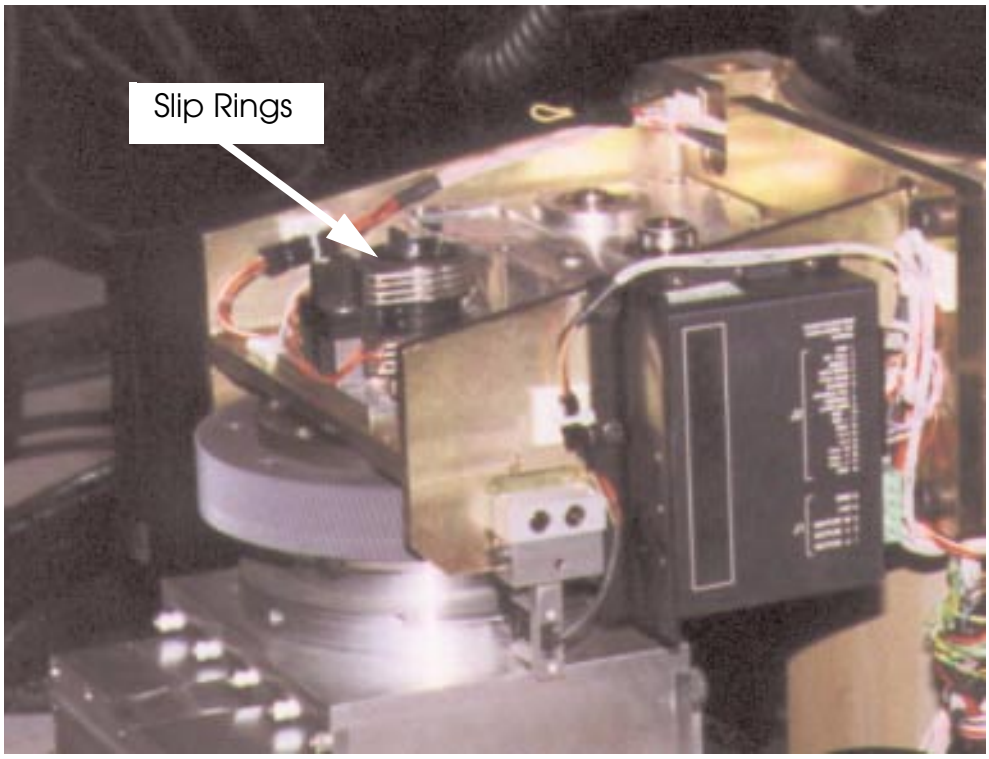
It is important to keep the slip rings on each wheel assembly clean in order maintain good electrical contact.

Be very careful not to bend or break the brushes when you clean the slip rings.

1. Remove the three wheel covers as described in the previous section.
2. Remove the slip ring covers from the wheel assemblies.



3. Use a dry cotton swab (Q-Tip) or one moistened with 91% pure (or greater) Isopropyl Alcohol (typically used for cleaning of VTR heads) to carefully clean the slip ring surfaces on each wheel assembly.



Examining The Wheels

A fully loaded pedestal can weigh up to 845 lb (384 kg). Therefore, it is essential that the pedestal is not driven over holes or sharp objects that would cause substantial impact to the wheel assemblies.

Once a month, remove the wheel covers (as described earlier in this chapter) and check the wheels and gear train for any possible damage due to abuse such as riding over sharp objects.

If there is any obvious wheel or gear damage, it should be repaired immediately by replacement of damaged parts. Also, the cause of damage should be researched and avoided in the future.

This page left blank intentionally.

Cylinder Replacement

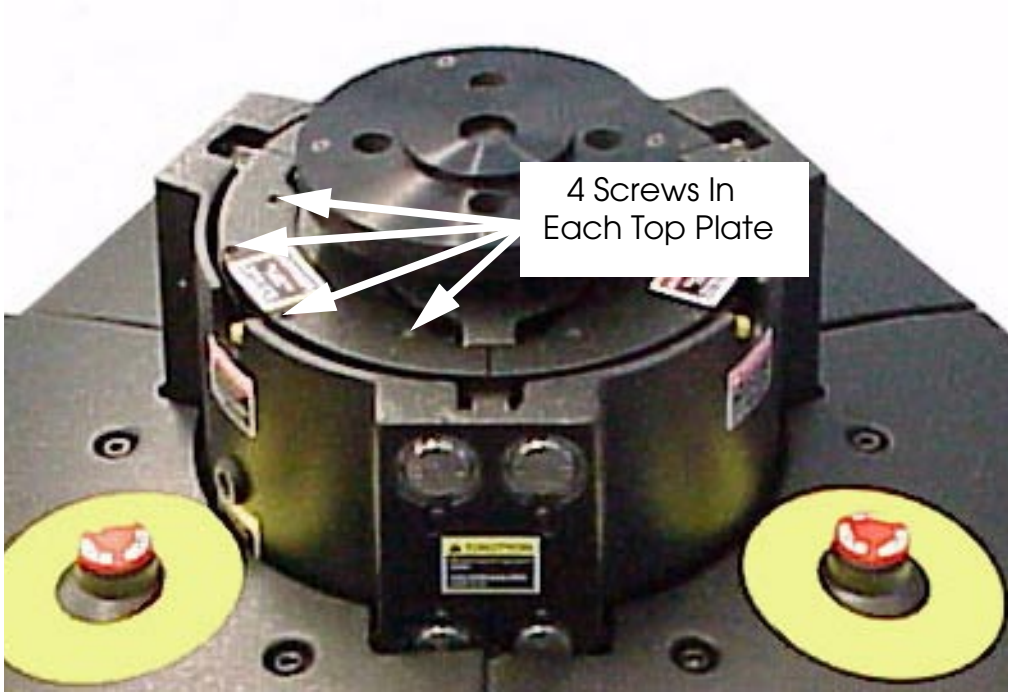
When you check the column balance, if you find that gas needs to be added frequently, you may need to replace one or more of the three cylinders in the column.

Remove the yellow dust caps and test each cylinder with a pressure gauge. If one or more cylinders is low relative to the others, use the following procedure to replace it.

1. Lower the column to minimum height and power down the pedestal.
2. Fully discharge the gas from the cylinders using the procedure in chapter 3.
3. Remove the payload and head from the pedestal. Refer to the documentation for the payload equipment and the User Manual for the pan/tilt head for specific instructions.

DANGER: DO NOT REMOVE THE SCREWS IN STEP 4 IF THE COLUMN IS PRESSURIZED. YOU CAN CAUSE SERIOUS INJURIES AND DAMAGE TO THE PEDESTAL.

4. Use a 3 mm hex key to remove the four socket head cap screws from the top plate over the cylinders being replaced. Set the top plate and screws aside.



5. Remove the cylinder from the column.

6. Install the replacement cylinder.
7. Install the top plate and tighten the four screws in the plate with a 3 mm hex key.
8. Install the head and payload. Refer to the User Manual for your head and the documentation for your payload equipment.
9. Presurize and balance the pedestal as described in chapter 3 of this manual.

Electronics Repair

Service Philosophy

Servicing is supported at three levels by Vinten Inc. after the 12-month warranty period expires:

- On-site service may be contracted from Vinten Inc. or through the representative from which the system was purchased.
- Board-level replacement may be readily accomplished by station personnel, using stocked or ordered circuit boards.
- Component level replacement is feasible to some extent, by qualified station engineers or technicians, using the material in this chapter.

Service questions may be directed to factory service specialists at Vinten Inc. in Valley Cottage, NY, by phone at 1-845 268-0100, or toll free (in the U.S.A.) at 1-888 4 VINTEN (1-888-484-6836). You can also fax Vinten at 1-845-268-0113. An emergency telephone service is available 24 hours a day, seven days a week using the 1-845-268-0100 or 1-888 4VINTEN numbers.

To streamline service and support, the same boards are used in multiple locations wherever possible. This allows you to swap boards in many cases to isolate a fault. For example, the 503 Power Amplifier (motor driver) is used six times in the SP-2000/X-Y (and twice in each head). The 4 Channel Servo Board is used twice in the SP-2000/X-Y (and once in each head). Note however, that the jumper setting (J1) on the 4 Channel Board must be changed depending on whether it is used for Steer, Drive or Pan/Tilt.

Safety

WARNING: Service should only be performed by qualified personnel, who are familiar with the equipment. At some points inside the power supplies 120 (or 240) volts AC is exposed, with a potential of electrical shock. Unless there is a power supply failure, the highest voltage present in the cable or pedestal should be no more than +42 VDC (±42 VDC in older dual voltage systems). The normal unregulated supply voltages supplied to the head are ±30 VDC.

WARNING: When you are working on a pedestal, disconnect the Power/Data cable to isolate the pedestal from the system.

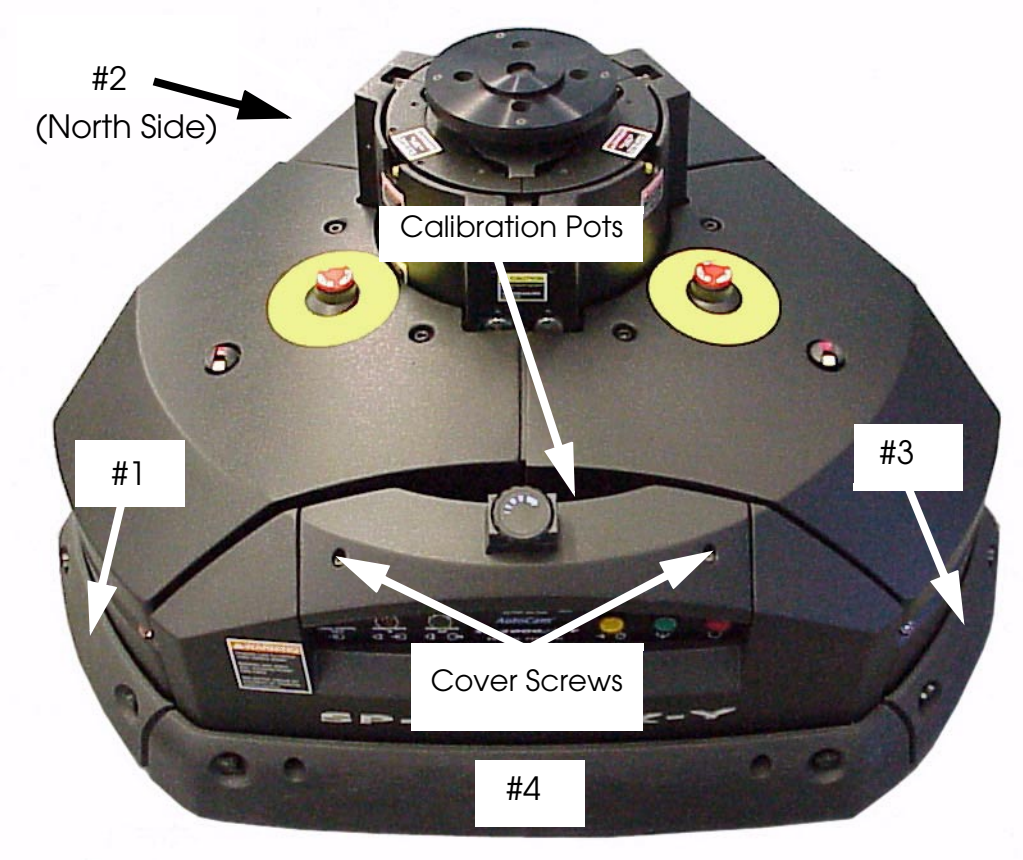
WARNING: Some maintenance procedures must be performed with the pedestal and head powered. There is danger that an unexpected motion could swing the head or move the pedestal, possibly striking or pinching you and causing physical injury. Read the Safety section in Chapter 1 of this User Manual before starting.

CAUTION: The camera/head combination, is very heavy - be especially careful when working under it.

Calibration

Collision Bumpers

All four detectors are connected to the detector circuit board mounted just below the cable clamp.



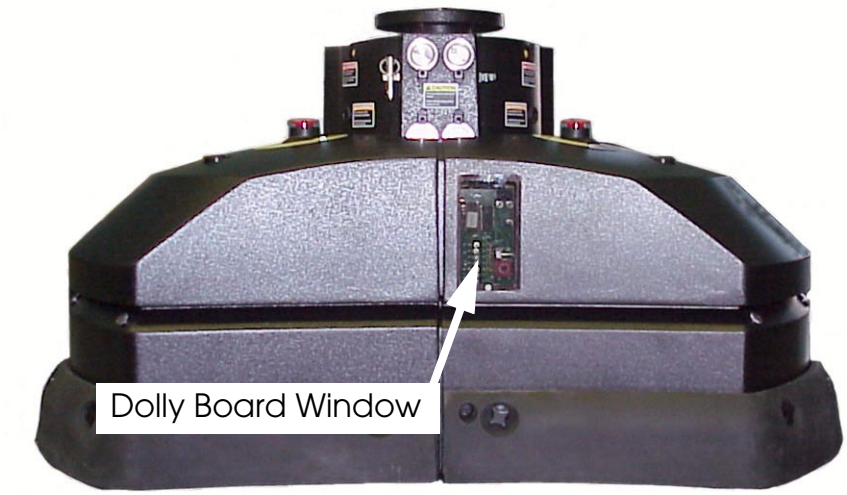
The potentiometer for each of the four collision detectors can be adjusted without removing the cover. Or, you can remove the cover (using a 3/16" hex key) for greater access. The collision bumpers are numbered 1 through 4 as shown above and the corresponding pots are numbered 1 through 4 from left to right.

1. Starting with #1, turn the pot clockwise slowly until the adjacent LED is a steady red. Turn the pot counterclockwise slowly until the LED is a steady green.
2. Press firmly on bumper #1 with your hand or foot. The #1 LED will turn red as you press on the bumper and back to green when you release. If the LED tends to flicker when you release the bumper, readjust pot #1.
3. Repeat these steps for the other three bumpers and pots.

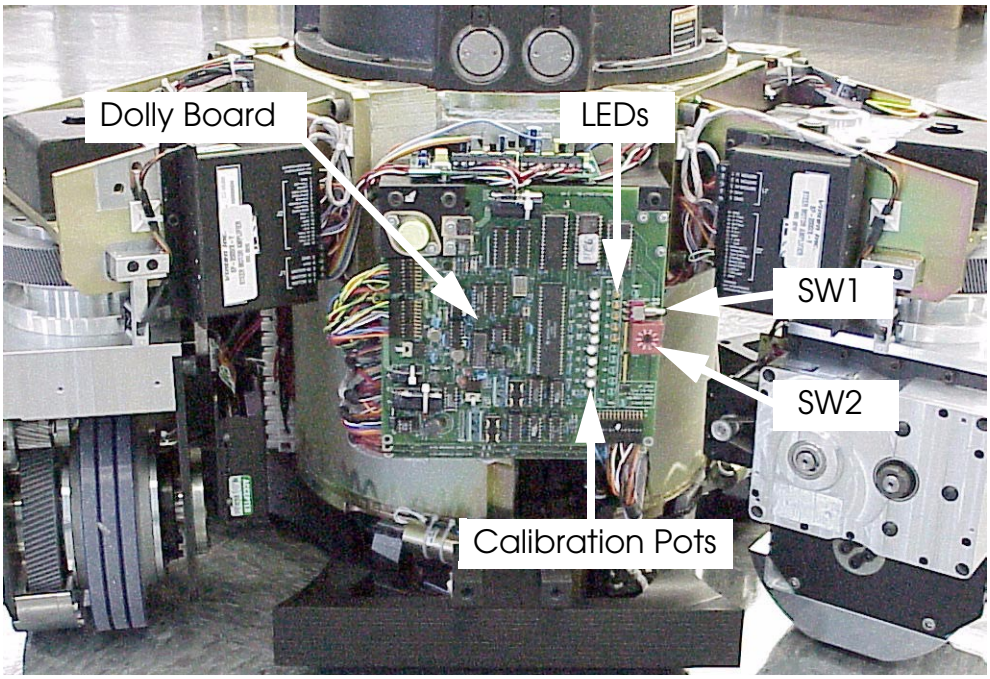
This page left blank intentionally.

Target Sensor Calibration

The calibration pots and indicators for the sensors are on the Dolly Board. The Dolly Board is mounted on the West side of the pedestal and is visible through the removable window in the North cover. Each sensor assembly contains three individual sensors, each with its own calibration pot on the Dolly Board.



The window allows you to monitor the sensor status during targeting and calibrate the sensors without removing the covers. Errors during targeting are an indication that sensor calibration and/or cleaning may be necessary. If the red ERR LED flashes after targeting, this indicates that one or more sensors are incorrectly set. In normal operating mode, the “light meter” LEDs are used as individual sensor indicators as marked on the board. Therefore, one or more of these LEDs will be on to indicate which sensor(s) need calibration.



If you are calibrating the sensors but not cleaning them, remove the window in the North cover and start with step 3.

1. Remove the three pedestal covers and thoroughly clean the sensors as described earlier in this chapter Also, clean the targets using Fantastic, 409 or a similar type of household cleaner.
2. When you disconnect the Stop switch harness as you remove each cover, install a jumper plug to bypass the switch and allow the pedestal to be operated with the covers removed.
3. Power up the pedestal, allow each wheel to initialize. Select Local on the MCB controller and center the pedestal over the target. This will position all three sensor assemblies over the target.
4. Turn the rotary switch SW2 so that the index mark is on position 1. The green RUN LED will turn off and the vertical row of LEDs is now functioning as a light meter. The "light meter" has 5 yellow (DS10 - DS14) and 5 green (DS5 - DS9) LEDs. The space between DS9 (green) and DS10 (yellow) is the threshold for detecting the white and black areas of the target. The goal during calibration is to set each sensor so that its reading for white (in the green region) and black (in the yellow region) is symmetrical above and below the "threshhold" point.
5. Press and release SW1, the DROP switch (located above the rotary switch) to energize the solenoids and drop the sensors. After about three minutes, the sensors will automatically retract . If the adjustments are not completed by that time, simply press and release SW1 again to drop the sensors for another three minutes.
6. Select Rotate on the MCB controller and rotate the pedestal until the East sensor assembly is over the black part of the target. Note which light meter LED is ON - it should be one of the yellow ones since the sensor is detecting black.
7. Rotate the pedestal until the East sensor assembly is over the white part of the target. Note which light meter LED is ON - it should be one of the green ones since the sensor is detecting white.
8. If the readings in steps 6 and 7 are already symmetrical, no adjustment is required. For example, if the readings are the third yellow LED down and the third green LED up, move on to step 10.
9. However, if the readings are not symmetrical, adjust R1 until they are. For example, if the reading s are the first yellow LED down and the third green LED up, adjust R1 until the third green LED goes out and the second green LED comes on. Rotate the pedestal between black and white and adjust the pot until the sensor readings are symmetrical.
10. Turn the rotary switch SW2 to position 2 and repeat steps 6 through 9 for the second East sensor, adjusting R2 if necessary.
11. Turn the rotary switch SW2 to position 3 and repeat steps 6 through 9 for the third East sensor, adjusting R3 if necessary.

12. Positions 4,5,6 on SW2 are for the three North sensors (the silkscreen on some dolly boards may be marked South). Use the same procedure (steps 6 through 9) for the North sensors adjusting R4, R5, R6 if necessary.
13. Use the same procedure (steps 6 through 9) for the West sensors (positions 7,8,9 of SW2) adjusting R7, R8, R9 if necessary.
14. After all of the sensors have been calibrated, set SW2 to position 0. The Sensor assemblies will be raised and the RUN LED will turn on.
15. Pull off the Reset jumper JMP1 (located above rotary switch SW2). All of the LEDs will turn on in rapid succession indicating that the microprocessor has been reset. Reinstall the jumper.
16. Switch the MCB controller to Remote and target the pedestal from the controller (refer to the controller User Manual). After the pedestal targets successfully, only the green OK LED on the Dolly Board should be on.
17. If the red ERR LED flashes after targeting, this indicates that one or more sensors are incorrectly set. In normal operating mode, the "light meter" LEDs are used as individual sensor indicators as marked on the board. Therefore, one or more of these LEDs will be on to indicate which sensor(s) need calibration. Repeat the adjustment for that particular sensor (or sensors) and reset the microprocessor by removing and reinserting the jumper JMP1.

    Never use the Reset jumper JMP1 unless the calibration procedure has just been completed. Otherwise, the automatic tracking thresholds will be replaced by the prior starting thresholds which probably are no longer optimum. If the jumper is accidentally reset, it is necessary to perform a complete calibration as described above.

If you did not remove the covers earlier, replace the window in the North cover and skip step 18.

18. Power down the pedestal and remove the jumper plug from the Stop switch harness for each cover. Replace the East, West and North covers as described earlier in this chapter.

This page left blank intentionally.

Theory Of Operation

System

Refer to the Dolly Wiring diagram in the drawings file for a block diagram of the overall AutoCam system. The primary circuit boards in the pedestal are the motor drivers, the 4-channel servo boards which control up to four motors each, the dolly board which handles targeting and several other functions and the battery-pack board which manages battery charging. Other components such as relays, switches and so on are also shown on the block diagram.

Power Bus

The boards in the pedestal are all connected to a common power bus. The power is nominally 36 volts DC.

Each board locally regulates its own operating voltages from the single 36V supply. Usually these on-board supplies include a 24V supply for relays, lamps, and solenoids, +15V and -15V for analog circuitry, and +5V for digital circuitry. The +5V and -15V supplies are switching supplies.

The pedestal should always be switched off before disconnecting cables. The dolly is designed to operate at voltages as high as 40V, but at voltages higher than approximately 45V, the circuit boards will clamp the voltage from going higher to minimize damage and will possibly blow on-board fuses in the process.

Data Bus

The data bus is a 4-wire bi-directional 9600-baud RS-422 signal originating at the controller, looping through the power supply to the pedestal. From the pedestal the data is looped up to the head. Feedback data from the pedestal loops through the power supply and back to the controller. With RS-422, both sides of the data leads are electrical mirror images of each other. Each should look like a TTL signal. A fault condition is indicated by identical signal phase on both lines, or one line stuck. Some types of problems with the data areas of the boards can block data from reaching other boards downstream. A symptom of missing data can be a useful troubleshooting aid. The on-board “happy light” LEDs are a valuable aid when troubleshooting data path problems.

The data frames are sent to and received from the dolly at 25ms intervals. Within each frame are command bytes for each servo axis, which each servo board picks off as appropriate. Each servo board has an address, as determined by an on-board jumper (J1) and the wiring harness. This allows 4-channel boards complete with ROMs to be interchangeable.

Under local control, the pan bar mounted joystick is used to drive and steer the pedestal with the dolly board generating the serial data instead of the controller.

Battery Pack and Power Management

The Battery Pack board manages the power to the pedestal. When the Standby/Charge button is pressed, the enable signal to the rack mounted AC power supply is pulled low. This trickle charges the batteries at the rate of approximately 0.5 amps. The maximum charge voltage is set at the factory by pots on the Battery Pack board. These pots should not normally be readjusted. However, calibration information is provided on the schematic should you need to make an adjustment. Overvoltage should be avoided as it offers no advantage and greatly shortens battery life. Battery life under normal operation should exceed five years.

The battery voltage is displayed on the LED voltmeter on the pedestal control panel. Depending on usage and how well the head and pedestal are balanced, the batteries should have enough capacity to run the dolly for several hours. Complete recharging takes overnight. Charging also takes place during normal AC powered operation in either the Standby/Charge or Run modes.

When the Run button is pressed, a chassis mounted relay connects power to the rest of the pedestal. If the AC power supply is connected via the cable to the pedestal, it will be turned on (if it was not already on), and supply voltages are passed through the Battery Pack board to the rest of the pedestal. If the voltage from the power supply drops out, the batteries will catch the load and maintain pedestal power. When the batteries are drained to the 10% point and only deliver 21 volts, the Battery Pack board will power down the dolly.

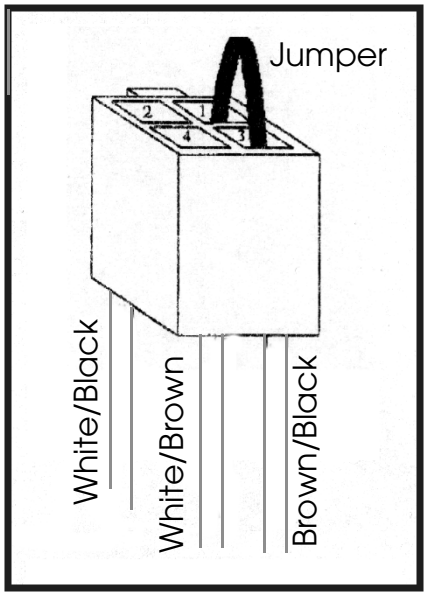
When operating without the AC power supply, the Run button starts delivery of battery power to the pedestal, under the control of the Battery Pack board. The battery pack also sources momentary high current demands made by the pedestal, even when the system is AC powered. This permits the use of cables that are lighter and longer than on previous systems.

Battery Bypass

In the event of a battery failure, you can use the following battery bypass procedure.

Bypassing the battery eliminates the ability to operate the pedestal in the event of power loss to the unit. Prompt service is essential to restore full operational capability.

1. Power down the pedestal and turn off the power supply in the rack.
2. Remove the pedestal rear cover.
3. Locate the back panel harness cables and identify the three in line Molex connectors that are marked “S” “D” and “B”.
4. Disconnect the Power Supply Molex connector marked “S”.
5. Disconnect the Contact Block Molex connector marked “D”. (Do not disconnect the battery harness marked “B”)
6. Connect the Power Supply Molex connector marked “S” (purple. black, red wires) to the Contact Block Molex connector marked “D” (purple, black, red wires).
7. Disconnect the four pin square female Berg connector from the top of the battery board on the back panel (located under the positive side of the balance meter).
8. Use a jumper wire to connect pins 1 (white/brown) and 3 (brown/black) on the four pin Berg connector.



9. Replace the pedestal cover.

10. Power up the pedestal for temporary operation without battery back up.

The Targeting System

The targeting system in the pedestal consists primarily of the Dolly Board and the three sensors. If the controller is operating normally, the cables are ok and the target itself is clean, a failure to target is likely to be caused by a problem in the sensors (cleaning or calibration) or the Dolly Board.

Lowering The Sensors

In normal operation, the Dolly Board supplies +24V to the three chassis mounted solenoids. Targeting is initiated by an active low signal from the Dolly Board to energize the solenoids and drop the sensors.

Each solenoid operates an arm to lower the respective sensor assembly onto the target. The arm is counterbalanced so that the arm lower smoothly when the solenoid is energized and will retract under the force of gravity.

The Sensor Assembly

Each sensor assembly contains three optosensors that generate red and infrared light and detect the light reflected off the target. The three sensors provide for redundancy in case of dirt or marks on the target. Each sensor assembly is connected by a cable to the Dolly Board that provides sensor power and detects the sensor output. The sensor assemblies are somewhat difficult to access, so their operation is best verified from measurements made on the Dolly Board.

If the sensors are kept clean (as described earlier in this chapter) and the targets themselves are also kept clean and free from damage such as delamination, there should be no need for electrical readjustments of the sensor voltage offsets.

The Dolly Board

The Dolly Board performs several functions including local control and targeting. When the pedestal is controlled by the MCB controller, the Dolly Board interprets the local control joystick output and generates the serial data signals to control the pedestal. The Dolly Board also controls the targeting operation. U15 and Q22 activate the solenoids which lower the three sensors to read the target. U19, U20, U21 and U16 interpret the signals from the three optosensors on each sensor assembly. The three signals from each sensor block are voted to reduce errors caused by floor dirt. The threshold values on the sensors are tracked electronically to allow for the slow accumulation of film on the optosensor windows.

The Dolly Board is controlled by microprocessor U9, with ROM (U3), RAM (U2), and peripheral devices. Basic operation of the microprocessor may be confirmed by looking for signal activity at pins 26, 27, and 28. The RS-422 data path section of U15, U27, U28 and associated circuitry manages the rerouting of data when control is transferred from remote to local. The analog section including U24, U25 and U17 buffers and measures signals from the joystick on the MCB controller.

The Dolly Board has an Auto Setup feature. After each successful targeting operation, the voltage excursions of each individual sensor are sensed and an offset voltage is stored in memory so that the voltage swing is kept symmetrical with respect to the 2.5V threshold.

4-Channel Servo Boards

Two of these boards form the core of the pedestal servo electronics (a third for pan, tilt, zoom and focus is in the head). Each board can control up to four motors. The board contains a microprocessor and related circuitry, local power supply regulation and data interconnections.

Although the three boards are electrically identical, the Shunt jumper (J1) in the lower right corner must be changed if you swap boards during troubleshooting. The jumper is on position 3 for Steer and position 4 for Drive. In the head for Pan/Tilt, no jumper is installed.

The four identical servo channels receive data commands from the controller via the local data bus at a frame rate of 25ms. This fast frame rate supports the highly responsive behavior of the AutoCam system to joystick commands. However, this rate is too coarse to feed the motors directly since it would cause rough movement. Therefore, the 25ms interval is linearly interpolated into shorter segments of a few milliseconds each. After each segment is computed, it is outputted as a position demand signal to the appropriate servo channel.

Each of the four servo channels is configured as either an analog channel with a position demand output, or a digital channel with a torque demand output.

Analog

The analog position demand output mode is only used to control zoom and focus on the lens. The circuitry is not used in the SP-2000/X-Y.

Digital

For the digital servo channels (steer, drive, height, pan, tilt), the servo loop is closed on the 4-channel board itself. Feedback is derived from an incremental encoder on the servo motor which generates the position follow signal. This follow signal is in the form of quadrature TTL signals which are counted by the on-board HCTL-2000 ICs. The follow signal is relayed to the microprocessor where it is compared to the interpolated demand signal. The difference between these two signals is the position error signal.

The servo produces a motor velocity which is proportional to the position error. The motor velocity (computed by differentiating the position follow signal, or subtracting subsequent motor positions) is subtracted from the position error to derive the velocity error. The servo controls the motor current to reduce the velocity error to zero by feeding the error to the on-board DAC and converting it to a voltage between -10V and +10V to generate the current (or torque) desired in the motor. The current demand signal leaves the board to feed the motor amplifier.

Brushless Motors

Seven brushless motors and their switching drivers are used in the SP2000/X-Y. One of the advantages of brushless motors is that they are quieter because they avoid the screechy high-frequency sound emitted by the brushes of conventional DC brush motors and tachometers. Tachometers are eliminated completely because the velocity information is derived from the Hall effect encoders. Brushless motors are far more reliable and are expected to last the life of the product. In addition, the switching drivers are very efficient, so power consumption is reduced and battery operating time is extended. Motor servicing is limited to verifying the integrity of the two quadrature signals coming back from each motor.

Motor Drive Amplifiers

The Motor Drive Amplifiers amplify the demand signal from the 4 Channel Board to generate a torque-producing current that drives the motor. In addition, they electronically commutate the brushless motor by processing the TTL phasing signals from the hall encoders. There are no adjustments on the Motor Drive Amplifiers. Each amplifier does have pluggable, factory selected current-setting resistors.

The Motor Drive Amplifiers for steer and drive are not serviceable at the component level in the field. However, they can be swapped with each other or the pan/tilt Motor Drive Amplifiers in the head to isolate a fault. Note that the Motor Drive Amplifier for column elevation is a 60V amplifier which cannot be swapped for troubleshooting.

Contact Vinten to arrange a board exchange if necessary. If replacement amplifiers are installed, the resistor values in the pluggable resistor packs must be checked and to be sure that they are the same as the original factory installed amplifiers.

Numerics

4-Channel Board, Theory Of Operation 4–35

A

ACP-8000 System 1–16
Active Lights 2–9
Applications 1–16
  ACP-8000 1–16
AutoCam Philosophy 1–14

B

Balance, Column 4–7
Balancing The Pedestal 3–12, 3–14
Battery Bypass 4–32
Battery Pack, Theory Of Operation 4–31
Brushless Motors 4–36
Bumper Operation 4–8
Bumper Override 1–8
Bypass The Batteries 4–32

C

Calibration
  Collision Bumper 4–24
  Collision Bumpers 3–16
  Target Sensor 4–26
Charging Status LEDs 2–5
Cleaning Slip Rings 4–16
Cleaning The Target Sensors 4–14
Cleaning The Targets 4–6
Collision Bumper 1–8, 4–8
Collision Bumper Calibration 3–16
Collision Bumper, Calibration 4–24
Column Balance 4–7
Column, Raising/Lowering 2–10
Compass Headings 2–3
Covers, Removing 4–9
Crating The Pedestal 3–25
Critical Data, SP-2000/X-Y iii
Customer Responsibility 1–5
Cylinder Replacement 4–20

D

Data Bus, Theory Of Operation 4–30
DC Power, Checking 4–7
Direction Indicators 2–8
Discharging The Pedestal 3–15
Dolly Board, Theory Of Operation 4–34
Drive 2–10
Drive Amplifiers 4–36

E

Electrical Installation/Interconnection 3–18
Electronics Repair 4–22
Emergency STOP Switches 2–6
E-STOP Switch 4–8
E-STOP Switches 1–2, 1–3, 2–6
Examining The Wheels 4–18

F

Floor Preparation 3–3

H

Height, Raising/Lowering 2–10

I

Indicators, Direction 2–8
Installation, Electrical 3–18
Installation, Tools Needed 3–2

L

Lights, Pedestal Active 1–6, 2–9
Local/Remote 2–10
Lowering The Column 2–10
Lowering The Sensors 4–34

M

Maintenance 4–6
- Checking The Wheels 4–18
- Claning Targets 4–6
- Cleaning Slip Rings 4–16
- Cleaning Target Sensors 4–14
- Collision Bumper 4–8
- Column Balance 4–7
- DC Power 4–7
- Overall Operation 4–7
- Removing Covers 4–9
- Removing Targets 4–6
- STOP Switch 4–8
- STOP Switches 4–7

Manual Outline 1–10
MCB Controller 2–10
- Drive 2–10
- Height 2–10
- Local/Remote 2–10
- Rotate 2–10

MCB Controller Mounting 3–11
Motor Drive Amplifiers 4–36
Motors, Brushless 4–36
Mounting The MCB Controller 3–11
Mounting The Pan/Tilt Head 3–10

O

Orientation 2–3

P

Pan/Tilt Head, Mounting 3–10
Payload, Removing 3–22
Pedestal Active Lights 1–6, 2–9
Pedestal Footprint 1–6
Pinch Points 1–9
Power Bus, Theory Of Operation 4–30
Power Management, Operation Theory 4–31
Powering Down 2–5
Powering Up 2–4
Pressurizing The Pedestal 3–12

R

Raising/Lowering The Column 2–10
Recrating The Pedestal 3–24
Removing Targets 4–6
Removing The Covers 4–9
Removing The Payload 3–22
Removing The Pedestal From Its Crate 3–4
Replacing Cylinders 4–20
Rotate 2–10
Routine Maintenance 4–6

S

Safe Operating Zone 1–6
Safe Working Environment 1–5
Safety 1–2
- Active Lights 1–6
- Bumper Override 1–8
- Collision Bumper 1–8
- Customer Responsibility 1–5
- Operating Zone 1–6
- Pedestal Footprint 1–6
- Pinch Points 1–9
- Sharp Edges 1–9
- STOP Switches 2–6
- Unexpected Motion 1–7
- Warning Signs 1–7
- Warnings 1–5
- Working Environment 1–5

Sensor, Target 4–34
Service Philosophy 4–22
Sharp Edges 1–9
Slip Rings, Cleaning 4–16
SP-2000/X-Y Critical Data iii
SP-2000/X-Y Servo Pedestal 1–12
Standby/Charge 2–5
Stop 2–5
Support, Technical iv
System, Theory Of Operation 4–30

T

Target
- Cleaning 4–6
- Removing 4–6

Target Sensor Assembly 4–34

Target Sensor Calibration 4–26
Target Sensors, Cleaning 4–14
Target Sensors, Lowering 4–34
Targeting 2–11
Targeting System, Theory Of Operation 4–34
Technical Support iv
Theory Of Operation 4–30
- 4 Channel Board 4–35
- Battery Pack 4–31
- Brushless Motors 4–36
- Data Bus 4–30
- Dolly Board 4–34
- Motor Drive Amplifiers 4–36
- Power Bus 4–30
- Power Management 4–31
- System 4–30
- Targeting System 4–34

Tools Neede For Installation 3–2
Typical Applications 1–16

U

Uncrating The Pedestal 3–4
Unexpected Motion 1–7
Unloading The Pedestal 3–6

W

Warning Labels ii
Warning Signs 1–7
Warnings 1–5
Warranty v
Wheels, Checking 4–18

This page left blank intentionally.